Release Note

Software Version 2.7.6

For AT-8800, Rapier i, AT-8700XL, AT-8600, AT-9900, AT-8900 and AT-9800 Series Switches and AR400 and AR700 Series Routers

Introduction 2
Upgrading to Software Version 2.7.6 3
Overview of New Features 4
Support for AT-8648T/2SP Switch 5
Enhancements to CLI Help 6
- Listing commands and valid parameters 7
- Completing parameters 8
- Listing valid options 8
- Command Change Summary 8

DHCP Snooping 9
- Overview 9
- The DHCP snooping binding database 9
- DHCP Filtering 11
- DHCP Option 82 11
- DHCP Snooping ARP Security 12
- Command Reference Updates 14

Deleting Dynamic ARP Entries 30
- Command Change Summary 30
- Command Reference Updates 31

Redistributing BGP Routes into RIP 32
- Filtering BGP Routes When Redistributing 32
- Command Change Summary 34
- Command Reference Updates 35

Classifying On Layer 4 Port Range 40
- Command Change Summary 40
- Command Reference Updates 41

Firewall Enhancements 46
- Session Monitoring 46
- Enhanced Network Address and Port Translation (ENAPT) 50
- Command Reference Updates 53

Reverse Telnet Without Authentication 63
- Command Reference Updates 64

Introduction

Allied Telesyn announces the release of Software Version 2.7.6 on the products in the following table. This Release Note describes the new features and enhancements.

Product series	Models
AT-9900	AT-9924T, AT-9924SP, AT-9924T/4SP
AT-8900	AT-8948
AT-9800	AT-9812T, AT-9816GB
Rapier i	Rapier 24i, Rapier 48i, Rapier 16fi
AT-8800	AT-8824, AT-8848
AT-8700XL	AT-8724XL, AT-8748XL
AT-8600	AT-8624T/2M, AT-8624PoE, AT-8648
AR700	AR725, AR745, AR750S
AR400	AR440S, AR441S, AR450S

The product series that each feature and enhancement applies to are shown in "Overview of New Features" on page 4. This Release Note should be read in conjunction with the Installation and Safety Guide or Quick Install Guide, Hardware Reference, and Software Reference for your switch or router. These documents can be found on the Documentation and Tools CD-ROM packaged with your switch or router, or:

www.alliedtelesyn.com/support/software

This Release Note has the following structure:

1. **Upgrading to Software Version 2.7.6**

   This section lists the names of the files that may be downloaded from the web site.

2. **Overview of New Features**

   This section lists the new features and shows the product families on which each feature is supported.

3. **Descriptions of New Features**

   These sections describe how to configure each new feature.

Caution: Information in this document is subject to change without notice and does not represent a commitment on the part of Allied Telesyn Inc. While every effort has been made to ensure that the information contained within this document and the features and changes described are accurate, Allied Telesyn Inc. can not accept any type of liability for errors in, or omissions arising from, the use of this information.

Upgrading to Software Version 2.7.6

Software Version 2.7.6 is available as a flash release that can be downloaded directly from the Software/Documentation area of the Allied Telesyn website:

www.alliedtelesyn.com/support/software

Software versions must be licenced and require a password to activate. If you upgrade to Software Version 2.7.6 from any 2.7.x version, your existing licence is valid for 2.7.6. Otherwise, to obtain a licence and password, contact your authorised Allied Telesyn distributor or reseller.

The following table lists the file names for Software Version 2.7.6.

Product name	Release file	GUI resource file	CLI help file
AT-9924T	89-276.rez	d9924e27.rsc	89-276a.hlp
AT-9924SP	89-276.rez	d9924e27.rsc	89-276a.hlp
AT-9924T/4SP	89-276.rez	d9924e27.rsc	89-276a.hlp
AT-8948	89-276.rez	—	89-276a.hlp
AT-9812T	sb-276.rez	d9812e27.rsc	98-276a.hlp
AT-9816GB	sb-276.rez	d9816e27.rsc	98-276a.hlp
Rapier 24i	86s-276.rez	dr24ie27.rsc	rp-276a.hlp
Rapier 48i	86s-276.rez	dr48ie27.rsc	rp-276a.hlp
Rapier16fi	86s-276.rez	dr16ie27.rsc	rp-276a.hlp
AT-8824	86s-276.rez	d8824e27.rsc	88-276a.hlp
AT-8848	86s-276.rez	d8848e27.rsc	88-276a.hlp
AT-8724XL	87-276.rez	d8724e27.rsc	87-276a.hlp
AT-8748XL	87-276.rez	d8748e27.rsc	87-276a.hlp
AT-8624PoE	sr-276.rez	—	86-276a.hlp
AT-8624T/2M	sr-276.rez	dsr24e27.rsc	86-276a.hlp
AT-8648T/2SP	sr-276.rez	—	86-276a.hlp
AR750S	55-276.rez	d750se27.rsc	700-276a.hlp
AR725	52-276.rez	d_725e27.rsc	700-276a.hlp
AR745	52-276.rez	d_745e27.rsc	700-276a.hlp
AR440S	54-276.rez	d440se27.rsc	400-276a.hlp
AR441S	54-276.rez	d441se27.rsc	400-276a.hlp
AR450S	54-276.rez	d450se27.rsc	400-276a.hlp

Overview of New Features

The following table lists the new features and enhancements by product series. For supported models, see "Introduction" on page 2.

	AR400	AR7x5	AR750S	Rapier	AT-8800	AT-8700XL	AT-8600	AT-9800	AT-8900	AT-9900
Support for AT-8648T/2SP Switch							✓			
Enhancements to CLI Help	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DHCP Snooping				✓	✓	✓	✓		✓	✓
Deleting Dynamic ARP Entries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Redistributing BGP Routes into RIP	✓	✓	✓	✓	✓			✓	✓	✓
Classifying On Layer 4 Port Range									✓	✓
Firewall: **Session Monitoring**	✓	✓	✓	✓	✓			✓	✓	
Firewall: **Enhanced Network Address and Port Translation (ENAPT)**	✓	✓	✓	✓	✓			✓	✓	
Reverse Telnet Without Authentication	✓	✓	✓	✓			✓			

Support for AT-8648T/2SP Switch

Software Release 2.7.6 supports the new AT-8648T/2SP switch.

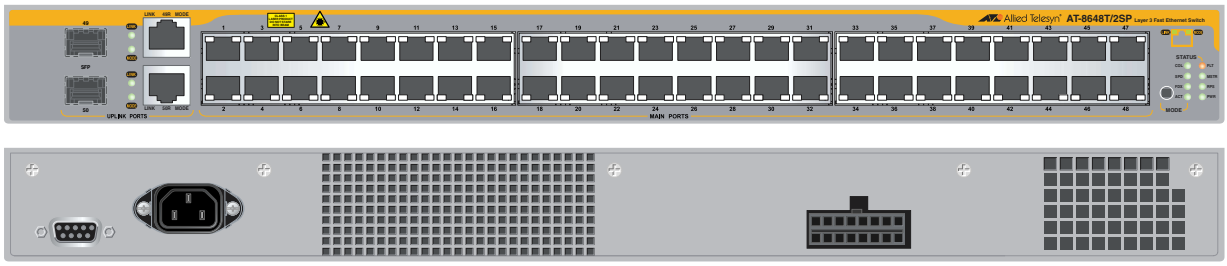
The AT-8600 Series switches are Layer 3 switches with Layer 2/3/4+ intelligence. These desktop multimedia switches bring a high level of security and traffic control to the edge of your network.

The new AT-8648T/2SP is a 48-port 10BASE-T/100BASE-TX Layer 3 Fast Ethernet Switch.

AT-8648T/2SP hardware description

- 48-port 10BASE-T/100BASE-TX (RJ-45 connectors)
- Two Gigabit uplink ports, SFP or Copper
- Auto-negotiating Advanced Fast Ethernet Switch

Figure 1: AT-8648T/2SP front and rear panel



The latest Hardware Reference can be found at www.alliedtelesyn.com/support/software.

Enhancements to CLI Help

Allied Telesyn routers and switches offer a number of methods of getting online command help:

- pressing the Tab key, to list valid command parameters and, if possible, complete parameters. This functionality is new in Software Version 2.7.6, and also provides helpful descriptions for a number of parameters
- pressing the ? key, to list valid command parameters. With Software Version 2.7.6, helpful descriptions are also listed for a number of parameters
- pressing the Tab or ? keys to list valid options for parameters
- pressing Ctrl+c to list previously-used commands and select from the list
- pressing Ctrl+r to search through the command history for matching commands. In earlier software versions, the Tab key performed this function
- using the up and down arrow keys to scroll through the command history
- entering the **help** command, to list the full syntax of all commands that are valid for a given topic

In earlier software releases, the Tab key searched through the command history for matching commands. To do this with Software Version 2.7.6, use Ctrl+r instead.

The following sections give examples of the new functionality.

The examples are from an AR450S router. Some of the displayed commands may not be valid on your router or switch model.

Note that the ? or Tab key does not display on screen. The following figures include a ? or the word <Tab> to show what to type.

Listing commands and valid parameters

You can now use either the Tab key or the ? key to find out which parameters you can type next, as summarised in the following table

To...	Press Tab or ? key after...	Example
List all top-level command keywords with a one-line description of each	The blank command prompt	Figure 2
List all parameters that can complete the command, with a one-line description of some	A parameter and a space	Figure 3

Figure 2: Listing all top-level command keywords with the question mark

```
Manager >?

 ACTivate     Cause an action to be taken immediately
 ADD          Add new items to existing objects or instances
 CLear        Erase memory (NVS or FLASH) totally - use with extreme caution!
 Connect      Connect to a named Telnet or interactive host service or asyn port
 COPy         Copy a file in NVS or FLASH memory
 CREate       Make a new object or new instance of an object
 DEACTivate   Cause an action in progress to stop immediately
 DELete       Remove items from existing objects or instances
 DESTroy      Remove an object or an instance of an object
 DISable      Suspend the operation of an object but keep its configuration
 Disconnect   Terminate a session to a Telnet or interactive host service
 DUMP         Display the contents of a memory location for diagnostic purposes
 EDit         Invoke the built-in text editor to edit a file
 ENAble       Allow an object to enter its operational state
 FINGer       Send a finger query to the finger server on the specified host
 FLUsh        Force the queue of log messages to be processed and emptied
 Help         Display online help for the command line interface
 LOAd         Transfer a file from a remote server to FLASH or NVS memory
 LOGIN        Log on to the CLI and be authenticated as an authorised user
 LOgoff       Log out of the CLI, to prevent unauthorised access to the CLI
--More--  (<space> = next page, <CR> = one line, C = continuous, Q = quit)
```

Figure 3: Listing valid parameters with the Tab key

```
Manager > add ospf range=192.168.1.0 <Tab>

 AREa
 EFFect
 MASK

Manager > add ospf range=192.168.1.0
```

Completing parameters

You can now use the Tab key to complete parameters (Figure 4). You must first type enough letters to match only one parameter.

Figure 4: Completing a parameter with the Tab key

```
Manager > add ospf ra<Tab>

Manager > add ospf range
```

If you press the Tab key without first typing enough letters to uniquely identify a parameter, the router or switch lists all matching parameters (Figure 5). This is the same as the existing ? key behaviour.

Figure 5: Listing matching parameters with the Tab key

```
Manager > a<Tab>

 ACTivate     Cause an action to be taken immediately
 ADD          Add new items to existing objects or instances

Manager > a

Manager > add ospf r<Tab>

 RANge
 REDistribute

Manager > add ospf r
```

Listing valid options

You can now use the Tab key to list parameter options, by typing it after the parameter and an equals sign (Figure 6). This is the same as the existing ? key behaviour.

Figure 6: Listing options with the Tab key after parameter=

```
Manager > add ospf range=<Tab>

 required - an IP address in dotted decimal notation

Manager > add ospf range=
```

Command Change Summary

There are no changes to commands for this enhancement.

DHCP Snooping

In Software Release 2.7.6, DHCP snooping has been added to provide an extra layer of security via dynamic IP source filtering. Snooping filters out messages received from unknown, or "untrusted" ports, and builds and maintains a DHCP snooping binding database.

DHCP snooping is disabled by default, and is user configurable.

Overview

Dynamic Host Configuration Protocol (DHCP) dynamically assigns IP addresses to client devices. The use of dynamically assigned addresses requires traceability, so that a service provider can determine which clients own a particular IP address at a certain time.

With DHCP snooping, IP sources are dynamically verified, and filtered accordingly. IP packets that are not sourced from recognised IP addresses are filtered out. This ensures the required traceability.

Trusted and untrusted ports

DHCP snooping blocks unauthorised IP traffic from untrusted ports, and prevents it from entering the trusted network. Ports on the switch are classified as either **trusted** or **untrusted**:

- **Trusted** ports receive only messages from within your network.
- **Untrusted** ports receive messages from outside your network.

Enabling and disabling DHCP snooping

To enable DHCP snooping on the switch, use the command:

```
enable dhcpsnooping
```

To disable DHCP snooping on the switch, use the command:

```
disable dhcpsnooping
```

The DHCP snooping binding database

When you enable DHCP snooping, the switch snoops client DHCP lease information and records it in a DHCP snooping binding database.

The binding database contains current, dynamically allocated IP addresses. When you enable DHCP snooping, the switch intercepts all DHCP packets it receives, and sends them to the Central Processing Unit (CPU) where they are verified. The binding database stores and maintains this information, and installs IP source filters on ports associated with client leases.

Lease structure

Each lease in the database holds the following information:

- the MAC address of the client device
- the IP address that was allocated to that client
- time until expiry
- VLAN to which the client is attached
- port to which the client is attached

Database structure

The binding database is split into three sections:

- current valid entries
- entries with client lease but no listener.
  Listeners are processes within the switch that use the information contained in entries. The Classifier module is the listener that receives information from DHCP snooping.
- entries with no client lease and no listeners.

For more information about these database sections, see the **show dhcpsnooping database** command on page 26.

Adding static entries

Although the switch dynamically adds information to the binding database, you can also optionally add static entries to the database. This is typically used to add a DHCP snooping entry for a client that has a preconfigured IP address on an untrusted port. To do this, use the command:

```
add dhcpsnooping binding interface=vlan ip=ipadd
  port=port-number
```

Configuring a check interval

You can configure a check interval, in seconds, for the binding database. This determines how often dynamic entries are checked for expiration. Expired entries are automatically deleted from the database.

Static entries defined with the **add dhcpsnooping binding** command on page 14 are not checked.

To configure a check interval for the binding database, use the command:

```
set dhcpsnooping checkinterval=1..3600
```

The switch receives expiry information with the client lease. Entries expire when the time left to expiry is 0 seconds.

All dynamic entries remaining in the database after each check are written to the bindings.dsn file. Whenever DHCP snooping is enabled using the **enable dhcpsnooping** command on page 18, the DHCP snooping binding database is recreated. Any entries that are still current are added to the database.

To view the current DHCP snooping binding database, use the command:

```
show dhcpsnooping database
```

DHCP Filtering

DHCP filtering prevents IP addresses from being falsified or "spoofed". This guarantees that customers cannot avoid detection by spoofing an IP address that was not actually allocated to them.

The switch only allows packets to enter via a given port if they have a source IP address that matches an IP address allocated to a device connected to that port.

For AT-8600, AT-8700XL, Rapier, and AT-8800 switches, filtering is automatic and does not require any configuration.

For AT-8900 and AT-9900 switches, you must create classifiers and incorporate them into a QoS configuration. To create classifiers, use one or both of the new **dhcpsnooping** options in the command:

```
create classifier=rule-id [macsaddress=dhcpsnooping]
   [ipsaddress=dhcpsnooping]
```

You can treat these classifiers like all other classifiers, and use them as part of any QoS or filtering configuration.

DHCP Option 82

You can configure DHCP snooping to insert DHCP Option 82 information into client-originated DHCP packets.

Trusted network elements insert Option 82 into the DHCP options field when forwarding client-originated BOOTP/DHCP packets to a DHCP server. DHCP servers that are configured to recognise Option 82 may use the information to implement IP addresses, or other parameter assignment policies, based on the network location of the client device.

When you enable Option 82 information for DHCP snooping, the switch inserts Option 82 information into BOOTP request packets received from an untrusted port. The switch inserts the following Option 82 information:

- Remote-ID. This specifies the MAC address of the switch.
- Circuit-ID. This specifies the switch port and VLAN-ID that the client-originated DHCP packet was received on.
- Subscriber-ID (optional). This is a string of up to 50 characters that differentiates or groups client ports on the switch.

Regardless of whether Option 82 is enabled for DHCP snooping, if the switch receives a BOOTP request packet on:

- an **untrusted** port, it drops the packet if it contains Option 82 information
- a **trusted** port, and the packet contains Option 82 information, it does not update the Option 82 information for the receiver port

The switch only removes Option 82 information from BOOTP reply packets destined for an **untrusted** port if the DHCP client hardware is directly attached to a port on the switch.

To enable Option 82, use the command:

```
enable dhcpsnooping option82
```

To disable Option 82, use the command:

```
disable dhcpsnooping option82
```

Note: If both DHCP snooping and Option 82 for DHCP snooping are enabled, the BOOTP relay agent Option 82 is unavailable.

For more information about Option 82, see RFC 3046, *DHCP Relay Agent Information Option*.

DHCP Snooping ARP Security

ARP security prevents ARP spoofing. ARP spoofing is when fake, or 'spoofed', ARP messages are sent to an Ethernet LAN. These messages contain false MAC addresses, confusing network devices.

When ARP security is enabled for DHCP snooping, the switch checks ARP packets sourced from untrusted ports against the entries in the DHCP snooping binding database. If it finds a matching entry, it forwards the ARP packet as normal. If it does not find a matching entry, it drops the ARP packet. This ensures that only trusted clients (with a recognised IP address) can generate ARP packets into the network.

To enable DHCP snooping ARP security, use the command:

```
enable dhcpsnooping arpsecurity
```

To disable DHCP snooping ARP security, use the command:

```
disable dhcpsnooping arpsecurity
```

Note: ARP security is not applied to packets received on trusted ports.
ARP security is applied to both dynamic and static DHCP snooping entries.

Command Change Summary

The following table summarises the new and modified commands (see Command Reference Updates).

Command	Change
add dhcpsnooping binding	New command
delete dhcpsnooping binding	New command
enable dhcpsnooping	New command
disable dhcpsnooping	New command
enable dhcpsnooping arpsecurity	New command
disable dhcpsnooping arpsecurity	New command
enable dhcpsnooping option82	New command
disable dhcpsnooping option82	New command
enable dhcpsnooping debug	New command
disable dhcpsnooping debug	New command
set dhcpsnooping checkinterval	New command
set dhcpsnooping port	New command
show dhcpsnooping	New command
show dhcpsnooping database	New command
show dhcpsnooping port	New command
show dhcpsnooping counter	New command
show dhcpsnooping filter	New command
create classifier	New **dhcpsnooping** option for **macsaddress** and **ipsaddress** parameters
set classifier	New **dhcpsnooping** option for **macsaddress** and **ipsaddress** parameters
show classifier	If a classifier specifies DHCP snooping, DHCPSNOOPING is displayed in the command output.

Command Reference Updates

This section describes any new commands and the changed portions of any modified commands and output screens. It uses boldface to highlight new parameters and options of existing commands, and new fields of existing output.

add dhcpsnooping binding

Syntax

```
ADD DHCPSnooping BINDing=macaddr INTerface=vlan IP=ipadd
   POrt=port-number
```

Description

This command adds a static entry to the DHCP snooping binding database. This is typically used to add a DHCP snooping entry for a client that has a preconfigured IP address on an untrusted port. The DHCP snooping entry you define must not already exist.

The switch does not check static entries for expiry. You must manually delete out-of-date static entries using the **delete dhcpsnooping binding** command on page 16.

Parameter	Description
BINDing	The MAC address of the client. The *macaddr* is an Ethernet six-octet MAC address expressed as six pairs of hexadecimal digits delimited by hyphens.
INTerface	The VLAN interface that the client is attached to. The *vlan* is a physical VLAN interface such as vlan46 or vlan122.
IP	The IP address of the client in dotted decimal notation.
POrt	The switch port number that the client is attached to. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports. For AT-8900 and AT-9900 switches only, the specified port must also have a QoS policy with a DHCP snooping classifier. For more information, see DHCP Filtering on page 11.

For more information about the binding database, see "The DHCP snooping binding database" on page 9

Example

To add a static DHCP snooping entry for a client with MAC address 00-00-cd-00-11-56, IP address 192.168.12.101, on port 6 of VLAN101, use the command:

```
add dhcps bind=00-00-cd-00-11-56 int=vlan101
   ip=192.168.12.101 po=6
```

create classifier

Syntax: non-IPv6 traffic

```
CREate CLASSifier=rule-id
   [MACSaddr={macadd|ANY|DHCPSnooping}]
   [MACDaddr={macadd|ANY}]
   [MACType={L2Ucast|L2Mcast|L2Bcast|ANY}] [TPID=tpid|ANY]
   [VLANPriority=0..7|ANY] [VLAN={vlanname|1..4094|ANY}]
   [INNERTpid=tpid|ANY] [INNERVLANPriority=0..7|ANY]
   [INNERVLANId=VLAN=1..4094|ANY]
   [ETHFormat={802.2-Tagged|802.2-Untagged|ETHII-Tagged|
   ETHII-Untagged|NETWARERAW-Tagged|Netwareraw-untagged|
   SNAP-Tagged|SNAP-Untagged|ANY}]
   [PROTocol={protocoltype|IP|IPX|ANY}]
   [IPDScp={dscplist|ANY}] [IPTOs={0..7|ANY}]
   [IPSAddr={ipaddmask|ANY|DHCPSnooping}]
   [IPDAddr={ipaddmask|ANY}]
   [IPPRotocol={TCP|UDP|ICMp|IGMp|ipprotocolnum|ANY}]
   [IPXDAddr={ipxadd|ANY}]
   [IPXDSocket={NCP|SAP|RIP|NNB|DIAg|NLSp|IPXwan|
   ipxsocketnum|ANY}]
   [IPXSSocket={NCP|SAP|RIP|NNB|DIAg|NLSp|IPXwan|
   ipxsocketnum|ANY}]
   [TCPSport={portid|port-range|ANY}]
   [TCPDport={portid|port-range|ANY}]
   [UDPSport={portid|port-range|ANY}]
   [UDPDport={portid|port-range|ANY}]
   [L4SMask=mask|ANY] [L4DMask=mask|ANY]
   [L5BYTE01=byteoffset,bytevalue[,bytemask]]
   [L5BYTE02=byteoffset,bytevalue[,bytemask]]
   [L5BYTE03=byteoffset,bytevalue[,bytemask]]
   [L5BYTE04=byteoffset,bytevalue[,bytemask]]
   [L5BYTE05=byteoffset,bytevalue[,bytemask]]
   [L5BYTE06=byteoffset,bytevalue[,bytemask]]
   [L5BYTE07=byteoffset,bytevalue[,bytemask]]
   [L5BYTE08=byteoffset,bytevalue[,bytemask]]
   [L5BYTE09=byteoffset,bytevalue[,bytemask]]
   [L5BYTE10=byteoffset,bytevalue[,bytemask]]
   [L5BYTE11=byteoffset,bytevalue[,bytemask]]
   [L5BYTE12=byteoffset,bytevalue[,bytemask]]
   [L5BYTE13=byteoffset,bytevalue[,bytemask]]
   [L5BYTE14=byteoffset,bytevalue[,bytemask]]
   [L5BYTE15=byteoffset,bytevalue[,bytemask]]
   [L5BYTE16=byteoffset,bytevalue[,bytemask]]
```

Description

The new **dhcpsnooping** option for the **macsaddress** and **ipsaddress** parameters applies the classifier to entries in the DHCP snooping binding database.

The **macsaddress** parameter specifies the source MAC address of the packets.

The **ipsaddress** parameter specifies the source IP address of the packets.

Example To create classifier 10 to match DHCP snooping entries, use any of the commands:

```
create classifier=10 ipsa=dhcps
create classifier=10 macs=dhcps
create classifier=10 ipsa=dhcps macs=dhcps
```

delete dhcpsnooping binding

Syntax `DELete DHCPSnooping BINDing=`*`macaddr`*

where:

- *macaddr* is an Ethernet six-octet MAC address expressed as six pairs of hexadecimal digits delimited by hyphens.

Description This command deletes a dynamic or static entry from the DHCP snooping binding database.

The **binding** parameter specifies the MAC address of the database entry to delete.

Example To delete a DHCP snooping entry for a client with MAC Address 00-00-cd-00-11-56, use the command:

```
del dhcps bind=00-00-cd-00-11-56
```

disable dhcpsnooping

Syntax `DISable DHCPSnooping`

Description This command disables DHCP snooping on the switch. The DHCP snooping binding database is updated and saved to the bindings.dsn file.

For AT-8600, AT-8700XL, Rapier, and AT-8800 switches, the switch:

- deletes all DHCP snooping filter entries
- stops automatically dropping all IP packets

For AT-8900 and AT-9900 switches, the switch:

- deletes all DHCP snooping filter entries
- stops using classifiers that are linked to DHCP snooping

Example To disable DHCP snooping, use the command:

```
dis dhcps
```

disable dhcpsnooping arpsecurity

Syntax `DISable DHCPSnooping ARPSecurity`

Description This command disables ARP security for DHCP snooping. When the switch receives ARP packets on untrusted ports, it no longer checks to ensure that the source IP in the ARP packet is consistent with the information stored in the DHCP snooping binding database.

ARP security is disabled by default.

Example To disable DHCP snooping ARP security, use the command:

```
dis dhcps arps
```

disable dhcpsnooping debug

Syntax

```
DISable DHCPSnooping
   DEBug={ALL|ARPSecurity|CLASSifier|DATABase|PRocessing|
   FILter}
```

Description This command disables debugging for DHCP snooping.

Parameter	Description	
DEBug	The type of debugging to be disabled Default: no default	
	ALL	Disables all DHCP snooping debugging.
	ARPSecurity	Disables ARP security debugging.
	CLASSifier	Disables DHCP snooping classifier debugging.
	DATABase	Disables DHCP snooping binding database debugging.
	FILter	Disables DHCP snooping filter debugging.
	PRocessing	Disables DHCP snooping packet processing debugging.

Example To disable all DHCP snooping debugging, use the command:

```
dis dhcps deb=all
```

disable dhcpsnooping option82

Syntax `DISable DHCPSnooping OPTion82`

Description This command disables DHCP Option 82 processing for DHCP snooped packets.

For more information about Option 82, see "DHCP Option 82" on page 11

Example To disable DHCP snooping Option 82, use the command:

```
dis dhcps opt
```

enable dhcpsnooping

Syntax `ENAble DHCPSnooping`

Description This command enables DHCP snooping on the switch. If the bindings.dsn file exists, the switch checks it, and adds any current entries to the DHCP snooping binding database. If the bindings.dsn file does not already exist, the switch creates it. When you enable DHCP snooping, and valid dynamic leases exist, the switch periodically writes the bindings.dsn file at every check interval. If no valid leases exist, the file is deleted.

By default, all ports are considered untrusted.

For AT-8600, AT-8700XL, Rapier, and AT-8800 switches, by default the switch drops all IP packets arriving on all untrusted ports. If the switch snoops a dynamic DHCP IP allocation, it modifies the filtering behaviour of the associated port. Instead of dropping all packets arriving on the port, it drops all packets except those coming from the allocated IP address.

DHCP snooping is disabled by default.

Examples To enable DHCP snooping, use the command:

```
ena dhcps
```

enable dhcpsnooping arpsecurity

Syntax `ENAble DHCPSnooping ARPSecurity`

Description This command enables ARP security for DHCP snooping. When the switch receives ARP packets on untrusted ports, it checks them to ensure that the source IP in the ARP packet is consistent with the information stored in the DHCP snooping binding database. It discards ARP packets that do not pass this check.

DHCP snooping must also be enabled for this command to have any effect. ARP security is disabled by default.

For more information about ARP security, see "DHCP Snooping ARP Security" on page 12

Example To enable DHCP snooping ARP security, use the command:

```
ena dhcps arps
```

enable dhcpsnooping debug

Syntax

```
ENAble DHCPSnooping
   DEBug={ALL|ARPSecurity|CLASSifier|DATABase|PRocessing|
   FILter}
```

Description This command enables debugging for DHCP snooping.

Parameter	Description	
DEBug	The type of debugging to be enabled	
	ALL	Enables all DHCP snooping debugging.
	ARPSecurity	Enables ARP security debugging.
	CLASSifier	Enables DHCP snooping classifier debugging.
	DATABase	Enables DHCP snooping binding database debugging.
	FILter	Enables DHCP snooping filter debugging.
	PRocessing	Enables DHCP snooping packet processing debugging.

Example To enable all DHCP snooping debugging, use the command:

```
ena dhcps deb=all
```

enable dhcpsnooping option82

Syntax

```
ENAble DHCPSnooping OPTion82
```

Description This command enables DHCP Option 82 processing for DHCP snooped packets. When enabled, the switch:

- inserts DHCP Option 82 into DHCP snooped packets that it receives on untrusted ports
- removes DHCP Option 82 from DHCP snooped packets that it sends to untrusted ports.

DHCP snooping must also be enabled for this command to have any effect.

By default, Option 82 is disabled.

For more information about Option 82, see "DHCP Option 82" on page 11

Examples To enable DHCP snooping Option 82, use the command:

```
ena dhcps opt
```

set classifier

Syntax: non-IPv6 traffic

```
SET CLASSifier=rule-id
   [MACSaddr={macadd|ANY|DHCPSnooping}]
   [MACDaddr={macadd|ANY}]
   [MACType={L2Ucast|L2Mcast|L2Bcast|ANY}] [TPID=tpid|ANY]
   [VLANPriority=0..7|ANY] [VLAN={vlanname|1..4094|ANY}]
   [INNERTpid=tpid|ANY] [INNERVLANPriority=0..7|ANY]
   [INNERVLANId=VLAN=1..4094|ANY]
   [ETHFormat={802.2-Tagged|802.2-Untagged|ETHII-Tagged|
   ETHII-Untagged|NETWARERAW-Tagged|Netwareraw-untagged|
   SNAP-Tagged|SNAP-Untagged|ANY}]
   [PROTocol={protocoltype|IP|IPX|ANY}]
   [IPDScp={dscplist|ANY}] [IPTOs={0..7|ANY}]
   [IPSAddr={ipaddmask|ANY|DHCPSnooping}]
   [IPDAddr={ipaddmask|ANY}]
   [IPPRotocol={TCP|UDP|ICMp|IGMp|ipprotocolnum|ANY}]
   [IPXDAddr={ipxadd|ANY}]
   [IPXDSocket={NCP|SAP|RIP|NNB|DIAg|NLSp|IPXwan|
   ipxsocketnum|ANY}]
   [IPXSSocket={NCP|SAP|RIP|NNB|DIAg|NLSp|IPXwan|
   ipxsocketnum|ANY}]
   [TCPSport={portid|port-range|ANY}]
   [TCPDport={portid|port-range|ANY}]
   [UDPSport={portid|port-range|ANY}]
   [UDPDport={portid|port-range|ANY}]
   [L4SMask=mask|ANY] [L4DMask=mask|ANY]
   [L5BYTE01=byteoffset,bytevalue[,bytemask]]
   [L5BYTE02=byteoffset,bytevalue[,bytemask]]
   [L5BYTE03=byteoffset,bytevalue[,bytemask]]
   [L5BYTE04=byteoffset,bytevalue[,bytemask]]
   [L5BYTE05=byteoffset,bytevalue[,bytemask]]
   [L5BYTE06=byteoffset,bytevalue[,bytemask]]
   [L5BYTE07=byteoffset,bytevalue[,bytemask]]
   [L5BYTE08=byteoffset,bytevalue[,bytemask]]
   [L5BYTE09=byteoffset,bytevalue[,bytemask]]
   [L5BYTE10=byteoffset,bytevalue[,bytemask]]
   [L5BYTE11=byteoffset,bytevalue[,bytemask]]
   [L5BYTE12=byteoffset,bytevalue[,bytemask]]
   [L5BYTE13=byteoffset,bytevalue[,bytemask]]
   [L5BYTE14=byteoffset,bytevalue[,bytemask]]
   [L5BYTE15=byteoffset,bytevalue[,bytemask]]
   [L5BYTE16=byteoffset,bytevalue[,bytemask]]
```

Description

The new **dhcpsnooping** option for the **macsaddress** and **ipsaddress** parameters applies the classifier to entries in the DHCP snooping binding database.

The **macsaddress** parameter specifies the source MAC address of the packets.

The **ipsaddress** parameter specifies the source IP address of the packets.

set dhcpsnooping checkinterval

Syntax `SET DHCPSnooping CHEckinterval=1..3600`

Description This command sets a check interval for the DHCP snooping binding database. This determines how often dynamic database entries are checked for expiration. Static entries defined with the **add dhcpsnooping binding** command on page 14 are not checked.

The **checkinterval** parameter specifies the number of seconds between checks. The default interval is 60 seconds.

When the switch checks the database, it automatically deletes any expired entries from the database. An entry is considered expired if the time left to expiry is 0 seconds. The switch writes all dynamic entries remaining in the database after each check to the bindings.dsn file. Whenever you enable DHCP snooping using the **enable dhcpsnooping** command on page 18, the switch recreates the DHCP snooping binding database, and adds any entries that are still current to the database.

Defining a smaller check interval ensures greater security, as expired entries are removed closer to their actual expiry time.

Defining a longer check interval reduces CPU usage, as the database is checked less often.

Examples To set the check interval to 3 minutes, use the command:

```
set dhcps che=180
```

set dhcpsnooping port

Syntax For AT-8600, AT-8700XL, Rapier, and AT-8800

```
SET DHCPSnooping POrt={port-list|ALL} [MAXLeases=0..100]
   [SUBScriberid=subscriber-id]
   [TRusted={YES|NO|ON|OFF|True|False}]
```

For AT-8900 and AT-9900

```
SET DHCPSnooping POrt={port-list|ALL} [MAXLeases=0..520]
   [SUBScriberid=subscriber-id]
   [TRusted={YES|NO|ON|OFF|True|False}]
```

Description This command sets the DHCP snooping details for the specified ports.

Parameter	Description	
POrt	The ports on the device to which the specified settings will be applied. The *port-list* is a port number, a range (specified as n-m), or a comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m,* where *m* is the highest numbered Ethernet switch port. Default: no default	
MAXLeases	The maximum number of DHCP leases that the snooping binding database holds for the specified ports. Once the limit has been reached, any further DHCP allocations made to devices on that port are not stored in the database. Default: **1**	
SUBScriberid	The subscriber-ID for the port. *subscriber-id* is a character string, 0 to 50 characters in length. Valid characters are any alphanumeric characters. If the **subscriberid** contains spaces, it must be enclosed in double quotes. Wildcards are not allowed. If a subscriber-ID is specified, the subscriber-ID sub-option is included in the DHCP Option 82 field of client DHCP packets forwarded from the specified port. The subscriber-ID sub-option is only inserted if DHCP snooping Option 82 has been enabled. If an empty string is specified (**subscriberid=""** or **subscriberid=**) then the subscriber-ID sub-option is not inserted into client DHCP packets forwarded to a DHCP server. Use this method to delete a subscriber-ID from a port. Default: no subscriber-ID	
TRusted	The trusted status of the port: Default: **no**	
	NO OFF False	Un-trusted ports are used to connect to untrusted elements in a network, such as client devices. DHCP leases snooped on these ports are eligible to be added to the DHCP snooping database. ARP security, if enabled, is also applied to un-trusted ports. The value **no** sets the port as untrusted.
	YES ON True	Trusted ports are used to connect to trusted elements in a network such as server devices. DHCP leases snooped on trusted ports are not added to the DHCP snooping database. Traffic is allowed to flow unchecked on these ports. The value **yes** sets the port as trusted.

Examples To specify ports 1-4 as trusted ports, use the command:

```
set dhcps po=1-4 tr=yes
```

To set the subscriber-id of port 10 to “user 480105”, use the command:

```
set dhcps po=10 subs="user 480105"
```

To remove the subscriber-id for port 10, use the command:

```
set dhcps po=10 subs=""
```

show classifier

SHow CLASSifier[={*rule-id*|ALL}]

Description If a classifier specifies **dhcpsnooping** for the source MAC address or source IP address, this is displayed in the command output, as shown in the following example.

Figure 7: Example output from the **show classifier** command

```
 Classifier Rules
-------------------------------------------------------------
 Rule .................. 1
  D-MAC Address ........ ANY
  S-MAC Address ........ ANY
  M-Type ............... ANY
  S-VLAN ............... ANY
  E-Format ............. ANY
  Protocol ............. IP
  TPID ................. ANY
  VLAN Priority ........ ANY
  S-IP Address ......... DHCPSNOOPING
  D-IP Address ......... ANY
  IP Protocol .......... ANY
  TOS/DSCP ............. ANY

-------------------------------------------------------------
```

show dhcpsnooping

Syntax `SHow DHCPSnooping`

Description This command displays the current DHCP snooping configuration (Figure 8, Table 1).

Figure 8: Example output from the **show dhcpsnooping** command

```
DHCP Snooping Information
-----------------------------------------
DHCP Snooping ................ Enabled
  Option 82 status ........... Disabled
  ARP security ............... Disabled
  Debug enabled .............. None

DHCP Snooping Database:
  Full Leases/Max Leases ..... 1/52
  Check Interval ............. 60 seconds
-----------------------------------------
```

Table 1: Parameters in output of the **show dhcpsnooping** command

Parameter	Meaning
DHCP Snooping	Whether DHCP snooping is enabled or disabled.
Option 82 status	Whether DHCP Option 82 is enabled or disabled for DHCP snooping.
ARP security	Whether DHCP snooping ARP security is enabled or disabled for untrusted ports.
Debug enabled	A list of the debug options that have been enabled for DHCP snooping.
DHCP Snooping Database Section	
DHCP snooping binding database related information.	
Full Leases/Max Leases	The number of valid snooped leases, followed by the maximum number of leases allowed on the switch.
Check interval	The DHCP snooping database check interval. This shows how frequently the switch deletes expired entries.

show dhcpsnooping counter

Syntax `SHow DHCPSnooping COUnter`

Description This command displays current DHCP snooping counter information (Figure 9, Table 2).

Figure 9: Example output from the **show dhcpsnooping counter** command

```
DHCP Snooping Counters
------------------------------------------------------------
DHCP Snooping
  InPackets ..................... 1412
  InBootpRequests ............... 725
  InBootpReplies ................ 687
  InDiscards .................... 3

ARP Security
  InPackets ..................... 262
  InDiscards .................... 0
    NoLease ..................... 0
    Invalid...................... 0
```

Table 2: Parameters in output of the **show dhcpsnooping counters** command

Parameter	Meaning
DHCP Snooping section	
Counters related to DHCP packets processed by DHCP snooping.	
InPackets	The total number of packets processed by DHCP snooping.
InBootpRequests	The number of BOOTP request packets processed by DHCP snooping.
InBootpReplies	The number of BOOTP reply packets processed by DHCP snooping.
InDiscards	The number of packets dropped by DHCP snooping.
ARP Security section	
Counters related to ARP packets processed by DHCP snooping ARP security.	
InPackets	The total number of ARP packets processed by ARP security.
InDiscards	The total number of ARP packets discarded by ARP security.
NoLease	The number of ARP packets discarded by ARP security because there was no DHCP lease on the port.
Invalid	The number of ARP packets discarded by ARP security because their format was invalid.

show dhcpsnooping database

Syntax `SHow DHCPSnooping DATABase`

Description This command displays the information currently stored in the DHCP snooping database (Figure 10, Table 3).

Figure 10: Example output from the **show dhcpsnooping database** command

```
DHCP Snooping Binding Database
--------------------------------------
Full Leases/Max Leases ... 3/52
Check Interval ........... 60 seconds
Database Listeners ....... CLASSIFIER

Current valid entries
MAC Address        IP Address       Expires(s)  VLAN  Port       ID     Source
-------------------------------------------------------------------------------
00-00-cd-08-0c-2c  192.168.12.110   566         46    15         2      Dynamic
00-00-cd-08-0d-de  192.168.12.111   1023        46    16         3      Dynamic
00-00-cd-09-43-22  192.168.12.210   Static      46    12         4      User
-------------------------------------------------------------------------------

Entries with client lease but no listeners
MAC Address        IP Address       Expires(s)  VLAN  Port       ID     Source
-------------------------------------------------------------------------------
None...
-------------------------------------------------------------------------------

Entries with no client lease and no listeners
MAC Address        IP Address       Expires(s)  VLAN  Port       ID     Source
-------------------------------------------------------------------------------
00-00-cd-08-1d-de  192.168.12.112   3511        46    15         4      Dynamic
```

Table 3: Parameters in output of the **show dhcpsnooping database** command

Parameter	Meaning
Full Leases/Max Leases	The number of valid snooped leases, followed by the maximum number of leases allowed on the switch.
Check interval	The DHCP snooping database check interval. This shows how frequently the switch deletes expired entries.
Database listeners	A list of processes within the switch that make use of the binding database information. Currently, the Classifier module is supported.
Current valid entries	This section lists the current snooped DHCP leases on the specified ports, ordered by ascending MAC address. Entries in this section indicate that the Classifier listening module has been updated successfully. Dynamic sourced entries in this section indicate that a DHCP ACK packet was forwarded to the client. The **expires** parameter indicates the time in seconds until the lease is set to expire.
Entries with client lease but no listeners	This section lists the current snooped DHCP leases where a DHCP ACK packet was forwarded to the client, but a valid lease could not be established due to an error with the Classifier listening module. This can occur if DHCP snooping is disabled while there are current valid entries in the DHCP snooping database, and DHCP snooping is then reconfigured and re-enabled.

Table 3: Parameters in output of the **show dhcpsnooping database** command (cont.)

Parameter	Meaning
Entries with no client lease and no listeners	This section lists DHCP snooped leases that have no valid listener (the Classifier module), and for which the DHCP ACK was not forwarded to the client. This can occur if there is an error in the DHCP information. When the DHCP ACK is not forwarded to the client, the client continues to request a DHCP lease. For this reason, entries in this section are added with an **expires** time of 3600 seconds, regardless of the lease time contained in the DHCP ACK packet.
MAC Address	The client MAC address.
IP Address	The allocated client IP address.
Expires	The time in seconds before an entry expires.
VLAN	The VLAN that the lease is associated with.
PORT	The port that the lease is associated with.
ID	The DHCP snooping allocated ID number for this entry.
Source	The source of the DHCP snooping entry. "Dynamic" indicates that the switch added the entry as a result of snooping a DHCP IP allocation. "User" indicates that the user added the entry statically. "File" indicates that the switch added the entry from the bindings.dsn file when DHCP snooping was enabled.

show dhcpsnooping filter

Syntax `SHow DHCPSnooping FILter[=ALL]`

Description This command displays the current DHCP snooping filter information (Figure 11, Table 4).

If **all** is specified, all DHCP snooping filter entries are shown, even if they are currently unallocated. If **all** is not specified, only allocated entries are displayed.

Figure 11: Example output from the **show dhcpsnooping filter** command

```
DHCPSnooping ACL ( 1 entries )
ClassID    FlowID    Port    EntryID    IP Address/Port/Mac
-------------------------------------------------------------------------------
45521      1         1       1          192.168.11.19/1/00-00-cd-21-7c-fc
```

Table 4: Parameters in output of the **show dhcpsnooping filter** command

Parameter	Meaning
ClassID	Internally allocated classifier ID.
FlowID	• For AT-8600, AT-8700XL, Rapier, and AT-8800 Always 0. • For AT-8900 and AT-9900 The QoS flow group ID that the filter entry is associated with.
Port	The switch port number.
EntryID	The ID of the DHCP snooping database entry that generated the filter entry.
IP Address/Port/MAC	The allocated IP address, switch port number, and client MAC address.

show dhcpsnooping port

Syntax `SHow DHCPSnooping POrt[={`*`port-list`*`|ALL}]`

where:

- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port.

Description This command displays information about DHCP snooping for the specified ports (Figure 12, Table 5).

Figure 12: Example output from the **show dhcpsnooping port** command

```
DHCP Snooping Port Information:
------------------------------------------------------------
Port ..................... 1
  Trusted ................ Yes
  Full Leases/Max Leases ... 0/0
  Subscriber-ID ............

Port ..................... 2
  Trusted ................ No
  Full Leases/Max Leases ... 0/1
  Subscriber-ID ............

Port ..................... 3
  Trusted ................ No
  Full Leases/Max Leases ... 1/1
  Subscriber-ID ............ UserID 14424
```

Table 5: Parameters in output of the **show dhcpsnooping port** command

Parameter	Meaning
Port	The number of the switch port.
Trusted	The DHCP snooping trusted state of the port, either Yes or No.
Full Leases/Max Leases	The number of valid snooped leases on the port, followed by the maximum number of leases allowed on the port.
Subscriber-ID	The user allocated subscriber-ID that is added into the DHCP Option 82 field when DHCP snooping Option 82 is enabled.

Deleting Dynamic ARP Entries

Address Resolution Protocol (ARP) is used by the router or switch to dynamically learn the location of devices in its networks. When the router or switch receives a packet with an unknown destination address, it broadcasts an ARP request to determine where to send that packet. When a host replies and identifies itself as the destination for that address, the router or switch records this information in a dynamic ARP entry in its ARP cache. It uses that ARP entry to forward further packets to that address. Such dynamic ARP entries age out if there is no traffic to that address for (by default) 17-34 minutes. This removes entries for disconnected devices and devices that change their IP addresses.

If you swap a device in your network for another device that has the same IP address, the router or switch may be left with a stale ARP entry and be unable to forward packets to the new device. This is most likely if you swap in the device without taking the link to the router or switch down, for example, if it connects through a hub. Instead of waiting for such entries to time out, you can delete them.

Previous software versions allow you to delete individual ARP entries. Software Version 2.7.6 also lets you delete all dynamic entries in a single step. This is particularly useful if you do not know the relevant IP addresses.

The router or switch replaces the deleted ARP entries when it receives traffic for the relevant addresses. As long as the entries are relearnt quickly enough, deleting dynamic ARP entries does not affect:

- routes
- OSPF neighbour status
- BGP peer status
- the TCP/UDP connection status
- VRRP status

To delete a single dynamic or static entry, use the command:

```
delete ip arp=ipadd
```

To delete all dynamic ARP entries, use the new **alldynamic** option in the command:

```
delete ip arp=alldynamic
```

The **alldynamic** option does not delete static (manually-entered) ARP entries.

The router or switch generates a log message to record that dynamic ARP entries have been deleted.

Command Change Summary

The following table summarises the modified commands (see **Command Reference Updates**).

Command	Change
delete ip arp	New **alldynamic** option

Command Reference Updates

This section describes any new commands and the changed portions of any modified commands and output screens. It uses boldface to highlight new parameters and options of existing commands, and new fields of existing output.

delete ip arp

Syntax `DELete IP ARP={`*ipadd*`|`**`ALLDynamic`**`}`

where *ipadd* is an IP address in dotted decimal notation

Description The new **alldynamic** option deletes all dynamic ARP entries in the router or switch's ARP cache.

Redistributing BGP Routes into RIP

Software Release 2.7.6 enables you to configure RIP to redistribute BGP routes. You can redistribute up to 500 BGP routes as RIP routes, by using the command:

```
add ip rip redistribute protocol=bgp [limit=1..500]
    [metric=0..16] [routemap=routemap]
    [subnet={on|off|yes|no|true|false}]
```

This command enables you to set the RIP metric for the imported routes, choose whether to import subnet routes, specify the number of routes to import, and filter routes through a route map.

To change the settings for redistributing routes, use the command:

```
set ip rip redistribute protocol=bgp [limit=1..500]
    [metric=0..16] [routemap=routemap]
    [subnet={on|off|yes|no|true|false}]
```

To display the settings for redistributing BGP routes, and the number of BGP routes that RIP is currently redistributing, use the command:

```
show ip rip redistribute
```

To stop RIP from redistributing BGP routes, use the command:

```
delete ip rip redistribute protocol=bgp
```

The number of routes that RIP can redistribute is limited because RIP is not designed to process large numbers of routes. By default, the limit is set to 50. When the limit is reached, routes are no longer imported until existing routes are removed. Because they are BGP routes, BGP controls when the routes disappear. To ensure RIP imports the routes it needs to, we recommend you:

- minimise the number of routes in the BGP route table by configuring automatic summarising
- use a route map to select an appropriate subset of the BGP routes, as described in the next section

Filtering BGP Routes When Redistributing

To select the most appropriate routes for importing into BGP, you can apply a route map, using one of the commands:

```
add ip rip redistribute protocol=bgp [routemap=routemap]
    [other-options...]

set ip rip redistribute protocol=bgp [routemap=routemap]
    [other-options...]
```

The router or switch can use the route map to:

- accept or reject update messages on the basis of origin, community, AS path, next hop or Multi Exit Discriminator (MED)
- accept or reject particular routes, by comparing the update message's routes with a prefix list
- alter matching routes' metric and tag

Creating Route Maps

A route map consists of multiple entries, which are in effect individual filters. Each entry specifies both what it matches on, in a *match* clause, and what is done to matching traffic, in the entry's *action* and any *set* clauses it has.

The set clauses modify the characteristics of matching routes. If you want to change the characteristics of all candidate routes, configure an entry with no match clause. Such an entry matches all routes.

When RIP passes a BGP-sourced route through a route map:

1. It checks the entries in order, starting with the lowest numbered entry, until it finds a match.
2. It then takes the action specified by that entry's action parameter. If the action is **exclude**, it filters out that route. If the action is **include**, it filters in that route.
3. If the action is **include**, it modifies characteristics as specified by the entry's set clauses if there are any.
4. It then stops processing that route; it does not check the remaining entries in the route map.

Every route map ends with an implicit entry that matches all routes, with an action of **include**. This ensures that if no entries in a route map generate a match, the route is included without modification.

Creating a route map

You do not have to create a route map as a separate step—adding the first entry automatically creates it.

Configuring a match clause

The match clause for a route map entry determines which routes match the entry. A route map for use when importing BGP routes into RIP can match on any of the available BGP attributes, or can match a list of prefixes.

For the available match clause options, and details of how to create each match option, see the Filtering IP Routes chapter of the Software Reference.

Configuring a set clause

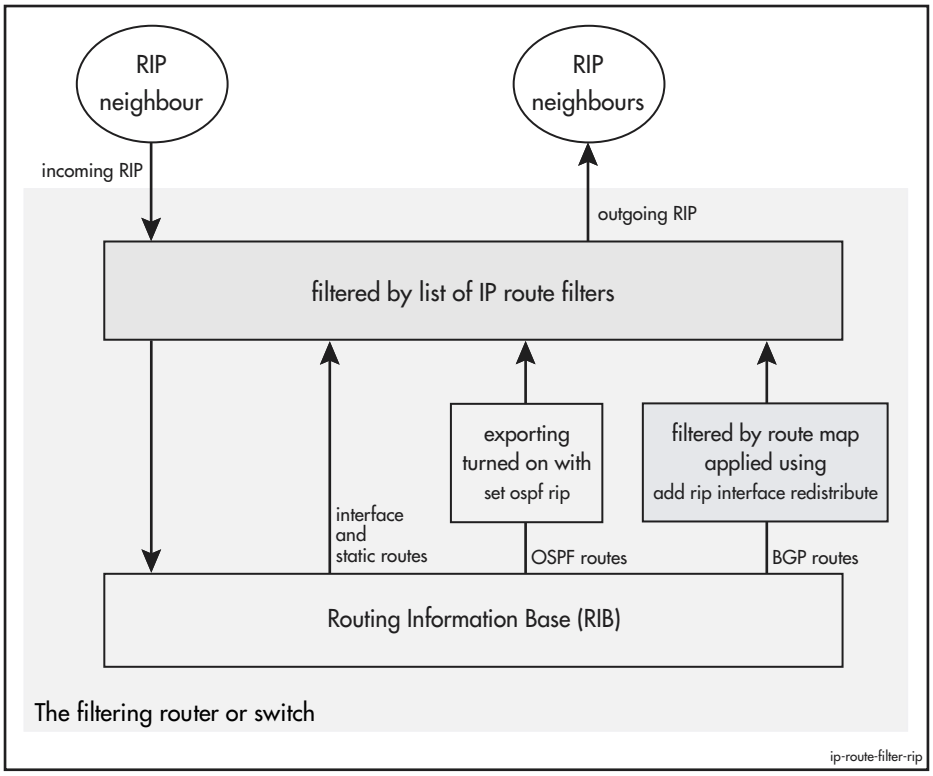
Once you have determined which routes a route map entry matches, you can configure set clauses to change the attributes of matching items.

To create a set clause for an entry, use one of the commands in the following table.

Command	Result
add ip routemap=*routemap* entry=1..4294967295 set metric=0..4294967295	Sets the RIP metric of matching routes. Routes with a lower metric are preferred. Metrics higher than 16 are treated as 16. Note that if you set the metric using the commands **add ip rip redistribute** or **set ip rip redistribute**, that metric overrides the route map's value.
add ip routemap=*routemap* entry=1..4294967295 set tag=1..65535	Tags the matching routes with an ID number. This lets you later identify the routes that came from BGP.

Overview of Filtering for RIP Routes

When the router or switch runs RIP, it receives routing information from neighbouring routers, and can advertise RIP, BGP, statically-configured and interface routes to neighbouring routers. You can filter routing information at the processing points shown in the following figure.



For more information, see the Filtering IP Routes chapter of the Software Reference.

Command Change Summary

The following table summarises the modified commands (see **Command Reference Updates**).

Command	Change
add ip rip redistribute	New command
delete ip rip redistribute	New command
set ip rip redistribute	New command
add ip routemap	A subset of existing parameters are valid when importing BGP routes into RIP. Also, the **metric** parameter can now specify a RIP metric
set ip routemap	A subset of existing parameters are valid when importing BGP routes into RIP. Also, the **metric** parameter can now specify a RIP metric

Command Reference Updates

This section describes any new commands and the changed portions of any modified commands and output screens. It uses boldface to highlight new parameters and options of existing commands, and new fields of existing output.

add ip rip redistribute

Syntax

```
ADD IP RIP REDistribute PROTocol=BGP [LIMit=1..500]
   [METric=0..16] [ROUTEMap=routemap]
   [SUBNET={ON|OFF|YES|NO|True|False}]
```

where *routemap* is a character string from 1 to 15 characters long

Description

This command enables the router or switch to redistribute BGP routes as RIP routes.

The **protocol** parameter specifies the routing protocol from which RIP will obtain the routes that it redistributes. **Protocol** must be set to BGP. You can also redistribute statically-configured routes into RIP by using the **staticexport** parameter of the **add ip rip interface** command.

The **limit** parameter specifies the maximum number of BGP routes that the router or switch can import into RIP. Importing too many routes into RIP reduces RIP's performance. The default limit is 50.

The **metric** parameter specifies the metric that RIP gives the imported routes. Note that if you set the metric with this parameter and in a route map, this parameter's value applies. If you do not specify a metric here or in a route map, RIP uses the route's original metric, or 16 if the metric is higher than 16.

The **routemap** parameter specifies a route map. You can use the route map to select routes for RIP to import, and to tag routes or change the route metric. The route map must already exist. To create a route map, use the **add ip routemap** command on page 38.

The **subnet** parameter specifies whether RIP can import subnet routes. This parameter only applies if the router or switch is configured to send RIP version 2 packets. If you specify **no**, RIP only imports classful network routes. If you specify **yes**, RIP imports both classful and classless network routes. The default is **yes**.

Example

To enable RIP to redistribute 50 BGP routes, which are selected by the route map called bgp_to_rip, use the command:

```
add ip rip red prot=bgp routem=bgp_to_rip
```

delete ip rip redistribute

Syntax

```
DELete IP RIP REDistribute PROTocol=BGP
```

Description This command stops RIP redistributing BGP routes, by deleting the redistribution entry.

Example To stop RIP from importing BGP routes, use the command:

```
del ip rip red prot=bgp
```

set ip rip redistribute

Syntax

```
SET IP RIP REDistribute PROTocol=BGP [LIMit=1..500]
   [METric=0..16] [ROUTEMap=[routemap]]
   [SUBNET={ON|OFF|YES|NO|TRUE|FALSE}]
```

where *routemap* is a character string from 1 to 15 characters long

Description This command changes the settings the router or switch uses when it redistributes BGP routes as RIP routes.

The **protocol** parameter specifies the routing protocol from which RIP will obtain the routes that it redistributes. **Protocol** must be set to BGP. You can also redistribute statically-configured routes into RIP by using the **staticexport** parameter of the **add ip rip interface** command.

The **limit** parameter specifies the maximum number of BGP routes that the router or switch can import into RIP. Importing too many routes into RIP reduces RIP's performance. The default limit is 50.

The **metric** parameter specifies the metric that RIP gives the imported routes. Note that if you set the metric with this parameter and in a route map, this parameter's value applies. To stop setting the metric, enter **metric=** without specifying a value. RIP then uses the route's original metric, or 16 if the metric is higher than 16.

The **routemap** parameter specifies a route map. You can use the route map to select routes for RIP to import, and to tag routes or change the route metric. The route map must already exist. To create a route map, use the **add ip routemap** command on page 38. To stop using a route map, specify **routemap=** without specifying a route map name.

The **subnet** parameter specifies whether RIP can import subnet routes. This parameter only applies if the router or switch is configured to send RIP version 2 packets. If you specify **off**, RIP only imports classful network routes. If you specify **on**, RIP imports classless network routes. The default is **on**.

Example To change the number of routes that RIP imports to 200, use the command:

```
set ip rip red prot=bgp lim=200
```

show ip rip redistribute

Syntax `SHow IP RIP REDistribute`

Description This command displays information about importing routes from BGP into RIP (Figure 13, Table 6).

Figure 13: Example output from the **show ip rip redistribute** command

```
RIP Route Redistribute

Protocol   RouteMap    Subnet   Metric   Redistribute/Limit
-----------------------------------------------------------
BGP        bgp_to_rip  Yes      10       68/100
-----------------------------------------------------------
```

Table 6: Parameters in output of the **show ip rip redistribute** command

Parameter	Meaning
Protocol	The routing protocol that the redistributed routes come from: BGP.
RouteMap	The name of the route map that selects routes for RIP to import, and/or changes the route metric.
Subnet	Whether RIP can import subnet routes; one of No (RIP only imports classful network routes) or Yes (RIP imports classless and classful network routes).
Metric	The metric RIP gives the imported routes, or "-" if the metric is not changed when redistributing. Note that a metric set by the route map overrides this setting.
Redistribute	The number of routes that RIP has redistributed.
Limit	The maximum number of routes that RIP can redistribute.

Examples To display the number of BGP routes that RIP has redistributed, use the command:

```
sh ip rip red
```

add ip routemap

Syntax for an empty entry

```
ADD IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}]
```

Syntax for a *match* clause

```
ADD IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch ASPath=1..99

ADD IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch COMmunity=1..99
   [EXAct={NO|YES}]

ADD IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion=INCLude] MAtch MED=0..4294967295

ADD IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch NEXThop=ipadd

ADD IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch
   ORIGin={EGP|IGP|INCOmplete}

ADD IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch
   PREFIXList=prefixlist-name

ADD IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch TAG=1..65535
```

Syntax for a *set* clause

```
ADD IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion=INCLude] SET METric=0..4294967295

ADD IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] SET TAG=1..65535
```

Description

No parameters or options have changed in Software Version 2.7.6. However, note that:

- only the above route map clauses are valid when redistributing BGP routes into RIP
- a **set metric** clause allows you to assign the same RIP metric to all imported routes. Numbers above 16 are treated as 16
- a **set tag** clause allows you to tag all imported routes. This means you can identify the route's original source, for example, in the output of the **show ip route** command

For more information, see the Filtering IP Routes chapter of the Software Reference.

set ip routemap

Syntax for an empty entry

```
SET IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}]
```

Syntax for a *match* clause

```
SET IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch ASPath=1..99

SET IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch COMmunity=1..99
   [EXAct={NO|YES}]

SET IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion=INCLude] MAtch MED=0..4294967295

SET IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch NEXThop=ipadd

SET IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch
   ORIGin={EGP|IGP|INCOmplete}

SET IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch
   PREFIXList=prefixlist-name

SET IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] MAtch TAG=1..65535
```

Syntax for a *set* clause

```
SET IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion=INCLude] SET METric=0..4294967295

SET IP ROUTEMap=routemap ENTry=1..4294967295
   [ACtion={INCLude|EXCLude}] SET TAG=1..65535
```

Description

No parameters or options have changed in Software Version 2.7.6. However, note that:

- only the above route map clauses are valid when redistributing BGP routes into RIP
- a **set metric** clause allows you to assign the same RIP metric to all imported routes. Numbers above 16 are treated as 16
- a **set tag** clause allows you to tag all imported routes. This means you can identify the route's original source, for example, in the output of the **show ip route** command

For more information, see the Filtering IP Routes chapter of the Software Reference.

Classifying On Layer 4 Port Range

Software Version 2.7.6 makes it easy to create a classifier that matches a range of source or destination TCP or UDP ports. In previous software versions, you could specify a port range by entering a port number and a mask. With Software Version 2.7.6, you can simply enter the first and last numbers in the range, separated by a hyphen. To do this, use one of the commands:

```
create classifier=rule-id [tcpsport={portid|port-range|any}]
    [tcpdport={portid|port-range|any}]
    [udpsport={portid|port-range|any}]
    [udpdport={portid|port-range|any}] [other-options...]

set classifier=rule-id [tcpsport={portid|port-range|any}]
    [tcpdport={portid|port-range|any}]
    [udpsport={portid|port-range|any}]
    [udpdport={portid|port-range|any}] [other-options...]
```

where *port-range* is a hyphen-separated range of TCP/IP or UDP/IP ports, such as 5550-5554.

The following table describes the Layer 4 port parameters.

When...	The classifier matches all packets whose...
TCPSport=*port-range*	source TCP port is in this range.
TCPDport=*port-range*	destination TCP port is in this range.
UDPSport=*port-range*	source UDP port is in this range.
UDPDport=*port-range*	destination UDP port is in this range.

The existing functionality, which allows you to specify a port number and mask, is still supported.

Command Change Summary

The following table summarises the modified commands (see **Command Reference Updates**).

Command	Change
create classifier	New *port-range* option on the Layer 4 port parameters.
set classifier	New *port-range* option on the Layer 4 port parameters.
show classifier	If a classifier specifies a range, the range is displayed in the command output.

Command Reference Updates

This section describes any new commands and the changed portions of any modified commands and output screens. It uses boldface to highlight new parameters and options of existing commands, and new fields of existing output.

create classifier

Syntax: non-IPv6 traffic

For non-IPv6 traffic:

```
CREate CLASSifier=rule-id
   [MACSaddr={macadd|ANY}] [MACDaddr={macadd|ANY}]
   [MACType={L2Ucast|L2Mcast|L2Bcast|ANY}] [TPID=tpid|ANY]
   [VLANPriority=0..7|ANY] [VLAN={vlanname|1..4094|ANY}]
   [INNERTpid=tpid|ANY] [INNERVLANPriority=0..7|ANY]
   [INNERVLANId=VLAN=1..4094|ANY]
   [ETHFormat={802.2-Tagged|802.2-Untagged|ETHII-Tagged|
   ETHII-Untagged|NETWARERAW-Tagged|Netwareraw-untagged|
   SNAP-Tagged|SNAP-Untagged|ANY}]
   [PROTocol={protocoltype|IP|IPX|ANY}]
   [IPDScp={dscplist|ANY}] [IPTOs={0..7|ANY}]
   [IPSAddr={ipaddmask|ANY}] [IPDAddr={ipaddmask|ANY}]
   [IPPRotocol={TCP|UDP|ICMp|IGMp|ipprotocolnum|ANY}]
   [IPXDAddr={ipxadd|ANY}]
   [IPXDSocket={NCP|SAP|RIP|NNB|DIAg|NLSp|IPXwan|
   ipxsocketnum|ANY}]
   [IPXSSocket={NCP|SAP|RIP|NNB|DIAg|NLSp|IPXwan|
   ipxsocketnum|ANY}]
   [TCPSport={portid|port-range|ANY}]
   [TCPDport={portid|port-range|ANY}]
   [UDPSport={portid|port-range|ANY}]
   [UDPDport={portid|port-range|ANY}]
   [L4SMask=mask|ANY] [L4DMask=mask|ANY]
   [L5BYTE01=byteoffset,bytevalue[,bytemask]]
   [L5BYTE02=byteoffset,bytevalue[,bytemask]]
   [L5BYTE03=byteoffset,bytevalue[,bytemask]]
   [L5BYTE04=byteoffset,bytevalue[,bytemask]]
   [L5BYTE05=byteoffset,bytevalue[,bytemask]]
   [L5BYTE06=byteoffset,bytevalue[,bytemask]]
   [L5BYTE07=byteoffset,bytevalue[,bytemask]]
   [L5BYTE08=byteoffset,bytevalue[,bytemask]]
   [L5BYTE09=byteoffset,bytevalue[,bytemask]]
   [L5BYTE10=byteoffset,bytevalue[,bytemask]]
   [L5BYTE11=byteoffset,bytevalue[,bytemask]]
   [L5BYTE12=byteoffset,bytevalue[,bytemask]]
   [L5BYTE13=byteoffset,bytevalue[,bytemask]]
   [L5BYTE14=byteoffset,bytevalue[,bytemask]]
   [L5BYTE15=byteoffset,bytevalue[,bytemask]]
   [L5BYTE16=byteoffset,bytevalue[,bytemask]]
```

Syntax: accelerated IPv6 traffic at Layer 3 processor

For accelerated IPv6 traffic, when applied on the Layer 3 processor of the accelerator on AT-8948 and AT-9924T/4SP switches:

```
CREate CLASSifier=rule-id [ETHFormat={ETHII-Tagged|ANY}]
   [PROTocol=IPV6] [IPDScp={0..63|ANY}]
   [IPSAddr={ipv6-add/prefix-length|ANY}]
   [IPDAddr={ipv6-add/prefix-length|ANY}]
   [IPPRotocol={TCP|UDP|ICMp|ipprotocolnum|ANY}]
   [TCPSport={portid|port-range|ANY}]
   [TCPDport={portid|port-range|ANY}]
   [UDPSport={portid|port-range|ANY}]
   [UDPDport={portid|port-range|ANY}]
   [L4SMask=mask|ANY] [L4DMask=mask|ANY]
```

where:

- *port-range* is a hyphen-separated range of TCP/IP or UDP/IP ports, such as 5550-5554.

Description

The new *port-range* option specifies a range of Layer 4 ports for the parameters in the following table. If you specify a port range, the **l4smask** or **l4dmask** parameters are invalid.

Parameter	Description
TCPSport=*port-range*	Source TCP port: the classifier matches all packets with a source TCP port in this range.
TCPDport=*port-range*	Destination TCP port: the classifier matches all packets with a destination TCP port in this range.
UDPSport=*port-range*	Source UDP port: the classifier matches all packets with a source UDP port in this range.
UDPDport=*port-range*	Destination UDP port: the classifier matches all packets with a destination UDP port in this range.

Example

To create classifier 10 which selects all packets with a destination TCP port in the range 5550 to 5554, use the command:

```
create classifier=10 tcpdport=5550-5554
```

set classifier

Syntax: non-IPv6 traffic

For non-IPv6 traffic:

```
SET CLASSifier=rule-id
   [MACSaddr={macadd|ANY}] [MACDaddr={macadd|ANY}]
   [MACType={L2Ucast|L2Mcast|L2Bcast|ANY}] [TPID=tpid|ANY]
   [VLANPriority=0..7|ANY] [VLAN={vlanname|1..4094|ANY}]
   [INNERTpid=tpid|ANY] [INNERVLANPriority=0..7|ANY]
   [INNERVLANId=VLAN=1..4094|ANY]
   [ETHFormat={802.2-Tagged|802.2-Untagged|ETHII-Tagged|
   ETHII-Untagged|NETWARERAW-Tagged|Netwareraw-untagged|
   SNAP-Tagged|SNAP-Untagged|ANY}]
   [PROTocol={protocoltype|IP|IPX|ANY}]
   [IPDScp={dscplist|ANY}] [IPTOs={0..7|ANY}]
   [IPSAddr={ipaddmask|ANY}] [IPDAddr={ipaddmask|ANY}]
   [IPPRotocol={TCP|UDP|ICMp|IGMp|ipprotocolnum|ANY}]
   [IPXDAddr={ipxadd|ANY}]
   [IPXDSocket={NCP|SAP|RIP|NNB|DIAg|NLSp|IPXwan|
   ipxsocketnum|ANY}]
   [IPXSSocket={NCP|SAP|RIP|NNB|DIAg|NLSp|IPXwan|
   ipxsocketnum|ANY}]
   [TCPSport={portid|port-range|ANY}]
   [TCPDport={portid|port-range|ANY}]
   [UDPSport={portid|port-range|ANY}]
   [UDPDport={portid|port-range|ANY}]
   [L4SMask=mask|ANY] [L4DMask=mask|ANY]
   [L5BYTE01=byteoffset,bytevalue[,bytemask]]
   [L5BYTE02=byteoffset,bytevalue[,bytemask]]
   [L5BYTE03=byteoffset,bytevalue[,bytemask]]
   [L5BYTE04=byteoffset,bytevalue[,bytemask]]
   [L5BYTE05=byteoffset,bytevalue[,bytemask]]
   [L5BYTE06=byteoffset,bytevalue[,bytemask]]
   [L5BYTE07=byteoffset,bytevalue[,bytemask]]
   [L5BYTE08=byteoffset,bytevalue[,bytemask]]
   [L5BYTE09=byteoffset,bytevalue[,bytemask]]
   [L5BYTE10=byteoffset,bytevalue[,bytemask]]
   [L5BYTE11=byteoffset,bytevalue[,bytemask]]
   [L5BYTE12=byteoffset,bytevalue[,bytemask]]
   [L5BYTE13=byteoffset,bytevalue[,bytemask]]
   [L5BYTE14=byteoffset,bytevalue[,bytemask]]
   [L5BYTE15=byteoffset,bytevalue[,bytemask]]
   [L5BYTE16=byteoffset,bytevalue[,bytemask]]
```

Syntax: accelerated IPv6 traffic at Layer 3 processor

For accelerated IPv6 traffic, when applied on the Layer 3 processor of the accelerator on AT-8948 and AT-9924T/4SP switches:

```
SET CLASSifier=rule-id [ETHFormat={ETHII-Tagged|ANY}]
   [PROTocol=IPV6] [IPDScp={0..63|ANY}]
   [IPSAddr={ipv6-add/prefix-length|ANY}]
   [IPDAddr={ipv6-add/prefix-length|ANY}]
   [IPPRotocol={TCP|UDP|ICMp|ipprotocolnum|ANY}]
   [TCPSport={portid|port-range|ANY}]
   [TCPDport={portid|port-range|ANY}]
   [UDPSport={portid|port-range|ANY}]
   [UDPDport={portid|port-range|ANY}]
   [L4SMask=mask|ANY] [L4DMask=mask|ANY]
```

where:

- *port-range* is a hyphen-separated range of TCP/IP or UDP/IP ports, such as 5550-5554.

Description

The new *port-range* option specifies a range of Layer 4 ports for the parameters in the following table. If you specify a port range, the **l4smask** or **l4dmask** parameters are invalid.

Parameter	Description
TCPSport=*port-range*	Source TCP port: the classifier matches all packets with a source TCP port in this range.
TCPDport=*port-range*	Destination TCP port: the classifier matches all packets with a destination TCP port in this range.
UDPSport=*port-range*	Source UDP port: the classifier matches all packets with a source UDP port in this range.
UDPDport=*port-range*	Destination UDP port: the classifier matches all packets with a destination UDP port in this range.

show classifier

```
SHow CLASSifier[={rule-id|ALL}]
```

Description If a classifier specifies a range, the range is displayed in the command output, as shown in the following example.

Figure 14: Example output from the **show classifier** command

```
 Classifier Rules
-------------------------------------------------------------
 Rule .................. 10
  D-MAC Address ........ ANY
  S-MAC Address ........ ANY
  M-Type ............... ANY
  S-VLAN ............... ANY
  E-Format ............. ANY
  Protocol ............. IP
  TPID ................. ANY
  VLAN Priority ........ ANY
  S-IP Address ......... ANY
  D-IP Address ......... ANY
  IP Protocol .......... TCP
  TOS/DSCP ............. ANY
  S-TCP Port ........... ANY
  D-TCP Port range ..... 5550-5554

-------------------------------------------------------------
```

Firewall Enhancements

Software Version 2.7.6 includes the following enhancements to the firewall:

- **Session Monitoring**
- **Enhanced Network Address and Port Translation (ENAPT)**

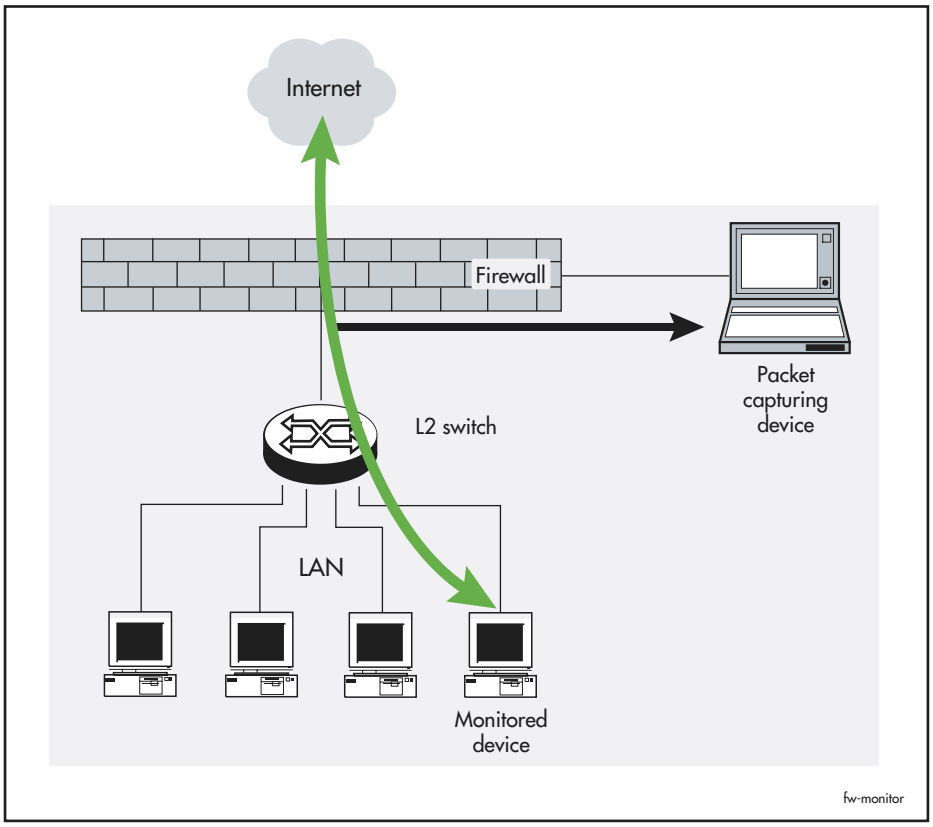
This section describes each enhancement, then the new and modified commands in **Command Reference Updates**.

Session Monitoring

Firewall session monitoring enables the firewall to copy all traffic that goes to and from specified IP addresses and send the copies to a packet capturing device. You can choose whether to copy packets before or after the firewall has processed them, or both. Session monitoring is useful:

- as an advanced diagnostic tool to check firewall configuration. By capturing packets on both the public and private sides of the firewall, you can compare packets before and after firewall processing. This enables you to check the effect of features such as NAT.
- if you need to monitor the traffic that passes through the firewall to or from certain hosts.

The following figure demonstrates monitoring of traffic to and from a single host on a LAN.



Monitoring only copies packets that pass through the firewall. It does not copy packets that the firewall blocks.

Configuring Session Monitoring

Monitoring is disabled by default. To configure it, you need to set up a packet capturing device to collect the packet copies, create a monitor, and enable monitoring. The following table lists the commands to use on the router or switch.

Step	Command	Action
1	—	Connect a device to capture the copies, such as a PC running packet capturing software, to an Eth port or a switch port.
1	create vlan=*vlan-name* vid=*vid* add vlan=*vlan-name* port=*port-number* [*other-options*...] add ip interface={eth*x*|vlan*x*} ip=*ipadd* [*other-options*...]	Configure the interface to which you connected the packet capturing device: • If you connected it to a switch port, put the port in a separate VLAN. • Give the Eth port or VLAN an IP address.
2	**add firewall monitor**=*monitor-id* ip=*ipadd* copyto=*ip-interface* [applyto={private|public|both}]	Create a monitor. Specify: • the IP address of the device you want to monitor • the interface to which you connected the capturing device, using the **copyto** parameter. • optionally, whether to monitor the private interface, the public interface, or both. The default is the private interface.
3	**enable firewall monitor**	Enable session monitoring.
4	**show firewall monitor**	Check the monitor configuration.

Effect of deleting interfaces

If a monitor is configured to send duplicated packets to an interface (the **copyto** interface) and you delete that interface, then the firewall deactivates that monitor. If you add the interface again, the firewall automatically reactivates the monitor.

Effect on firewall throughput

The firewall's throughput is affected by on how much traffic it monitors at once. For example, if the firewall monitors all the traffic that passes through it at a given time, it processes packets approximately half as fast as if it monitors no traffic.

Multiple monitors

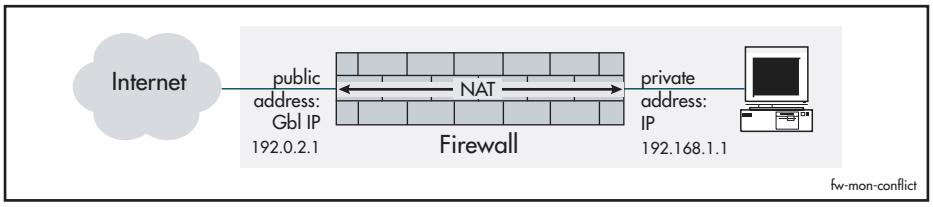
There is no limit on the number of devices you can monitor, although you should consider the performance impact of monitoring a high proportion of traffic.

The firewall determines which monitor to use on traffic by checking the monitor's IP address against all IP address fields for the session. These session fields appear in the output of the **show firewall session** command, and are summarised in the following table.

IP field name in session	Meaning
IP	The source address of outbound packets and the destination address of inbound packets in this session, as seen on the private side of the firewall.
Remote IP	The destination address of outbound packets and the source address of inbound packets in this session, as seen on the private side of the firewall.
Gbl IP	The source address of outbound packets and the destination address of inbound packets in this session, as seen on the public side of the firewall. If NAT is not configured, this is the same as IP.
Gbl Remote IP	The destination address of outbound packets and the source address of inbound packets in this session, as seen on the public side of the firewall. If NAT is not configured, this is the same as Remote IP.

Duplicate monitors

If two monitors monitor different addresses that are part of the same session, and both monitors apply on the same side of the firewall, then the firewall uses the last-created monitor. This avoids unnecessary packet duplication. For example, consider the scenario in the following diagram, in which NAT on the firewall translates between a private IP address (192.168.1.1, the IP entry in output from the **show firewall session** command) and a public IP address (192.0.2.1, the Gbl IP entry).



To monitor traffic in this scenario, you can apply a monitor to the private interface that specifies either the private address 192.168.1.1 or the public address 192.0.2.1. However, it is possible to create Monitor 1 that monitors the private address and then Monitor 2 that monitors the public address, by using the commands:

```
add firewall monitor=1 ip=192.168.1.1 copyto=vlan2
   applyto=private
add firewall monitor=2 ip=192.0.2.1 copyto=vlan3
   applyto=private
```

Both these monitors apply to sessions that match this scenario. The firewall uses Monitor 2, because it was the last monitor to be created. This means that copies of packets are sent to the **copyto** interface specified in Monitor 2, not the interface specified in Monitor 1.

If you delete the second monitor, the first monitor takes over. If the deleted monitor was monitoring a current session, monitoring may stop for a few seconds.

Command Change Summary

The following table summarises the new commands (see **Command Reference Updates**).

Command	Change
enable firewall monitor	New command
disable firewall monitor	New command
add firewall monitor	New command
delete firewall monitor	New command
set firewall monitor	New command
show firewall monitor	New command

Enhanced Network Address and Port Translation (ENAPT)

Software Version 2.7.6 supports Enhanced Network Address and Port Translation (ENAPT). With ENAPT, the firewall translates private IP addresses and ports to a public IP address and ports. It remembers the private to public mapping and applies the same mapping for all simultaneous sessions that involve the same private IP address and port.

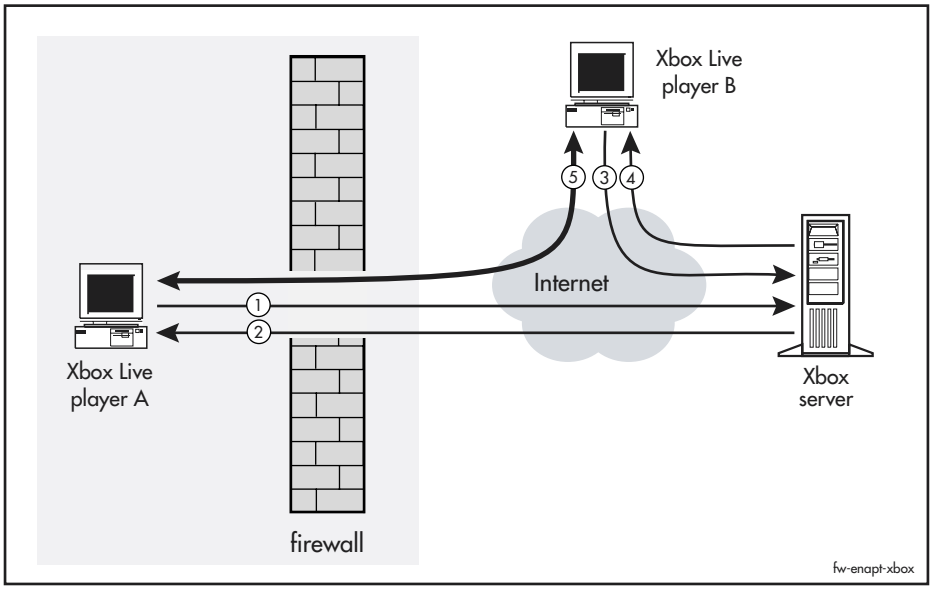
ENAPT is a port restricted cone NAT, as defined in RFC 3489, *STUN - Simple Traversal of User Datagram Protocol (UDP) Through Network Address Translators (NATs)*.

ENAPT combines:

- Enhanced NAT's ability to translate many private addresses to one public address
- NAPT's ability to avoid changes to the UDP or TCP port number

When to use ENAPT

ENAPT enables the firewall to work with applications in which a private device may initiate sessions with multiple external servers or hosts. One such application is Xbox Live ®, as shown in the following figure.



In the above figure, Xbox Live player A is behind the firewall which is performing ENAPT. Before playing, player A registers with the Xbox Live server (step 1) and the server replies (step 2). Likewise, player B registers with the server (steps 3 and 4). When the players wish to start a game with each other, the server tells each Xbox the public IP address and port of the other Xbox, and they establish a session between them (step 5). Player A's Xbox must use the same public IP address and port when communicating with the server and with player B, or player B cannot connect to player A.

ENAPT deletes the private to public mapping when the last session that uses that mapping closes. This has no effect when using it with Xbox Live, because the first session is initiated by the private device, but makes ENAPT less suitable than NAPT for use with VoIP systems.

Creating an ENAPT: interface-based

To add an interface-based ENAPT to a policy, use the new **nat=enapt** option in the **add firewall policy nat** command:

```
add firewall policy=policy-name nat=enapt interface=interface
    gblinterface=interface [gblip=ipadd[-ipadd]]
```

ENAPT translates packets' private IP addresses to one of the following public addresses:

- the address specified by the **gblip** parameter, if you specify a single IP address
- the lowest address in the range of addresses specified by the **gblip** parameter, if you specify a range.
- the IP address of the public interface, if you do not specify **gblip**. This is useful if the address of the public interface is dynamically-assigned and therefore changes.

ENAPT also translates a private port (such as 3074 for Xbox gaming) to a public port. The firewall randomly allocates the public port and remembers the private to public mapping. If you want to apply ENAPT to a particular private port, create a rule-based ENAPT instead of an interface-based ENAPT. If you need to control the private and public port, create a rule-based NAPT instead of using ENAPT.

Creating an ENAPT: rule-based

To add a rule-based ENAPT to a policy, use the new **nattype=enapt** option in the **add firewall policy rule** command:

```
add firewall policy=policy-name rule=rule-id action=nat
    nattype=enapt interface=private-interface
    protocol={protocol|all|egp|gre|icmp|ospf|sa|tcp|udp}
    gblip=ipadd [ip=ipadd[-ipadd]] [port=port]
    [sourceport=port]
    [other-options-to-match-packets]
```

For more information about the IP address and port parameters that are valid with ENAPT rules, and the translations, see "IP and port parameters in policy rules" on page 56.

You can create a rule that only applies to Xbox Live traffic by specifying the TCP/UDP port. All Xbox Live traffic has a source port of 3074. Traffic to the Xbox Live server also has a destination port of 3074, but the destination port of other Xboxes may vary. Therefore, to limit the rule to Xbox Live traffic, specify the source port by using **sourceport=3074**.

Increasing ICMP unreachable timeout

If you are configuring the firewall to allow Xbox Live sessions, also increase the ICMP unreachable message timeout. The timeout specifies the delay before the firewall deletes a session after it receives an ICMP unreachable message for that session. If you do not increase it, you may be unable to connect to remote Xboxes that are also behind a firewall. A suitable timeout is approximately 20 seconds. To set it, use the command:

```
set firewall policy=policy-name
    icmpunreachabletimeout=seconds [other-options]
```

Command Change Summary

The following table summarises the modified commands (see **Command Reference Updates**).

Command	Change
add firewall policy nat	New **enapt** option for **nat** parameter
add firewall policy rule	New **enapt** option for **nattype** parameter
set firewall policy	New **icmpunreachabletimeout** parameter
show firewall	The ICMP unreachable timeout is displayed. If a policy uses ENAPT, "enapt" is displayed in the NAT field.
show firewall policy	The ICMP unreachable timeout is displayed. If a policy uses ENAPT, "enapt" is displayed in the NAT field.

Command Reference Updates

This section describes any new commands and the changed portions of any modified commands and output screens. It uses boldface to highlight new parameters and options of existing commands, and new fields of existing output.

add firewall monitor

Syntax

```
ADD FIREwall MOnitor=monitor-id IP=ipadd
   COPyto=ip-interface [APPlyto={PRIVate|PUBlic|BOTH}]
```

where:

- *monitor-id* is an integer from 1 to 65535
- *ipadd* is an IPv4 address in dotted decimal notation
- *ip-interface* is a VLAN or Eth interface such as vlan2 or eth0. The interface can be a logical interface such as vlan2-1 or eth0-1

Description

This command specifies an IP address for the firewall to monitor. The firewall makes a copy of every packet that comes from and goes to that address. It sends the copy over the Eth interface or VLAN that you specify.

There is no limit on the number of IP addresses you can monitor, although you should consider the speed impact of monitoring a high proportion of traffic.

Caution: If you create two or more monitors that monitor a given firewall session on the same firewall **applyto** interface, the firewall only uses the last-created monitor.

The **monitor** parameter specifies an identification number for the monitor.

The **ip** parameter specifies the IP address of the monitored device. The firewall monitors any firewall sessions that have this IP address in any of the session fields. These session fields display in output from the **show firewall session** command, and are summarised in the following table.

IP field name in session	Meaning
IP	The source address of outbound packets and the destination address of inbound packets in this session, as seen on the private side of the firewall.
Remote IP	The destination address of outbound packets and the source address of inbound packets in this session, as seen on the private side of the firewall.
Gbl IP	The source address of outbound packets and the destination address of inbound packets in this session, as seen on the public side of the firewall. If NAT is not configured, this is the same as IP.
Gbl Remote IP	The destination address of outbound packets and the source address of inbound packets in this session, as seen on the public side of the firewall. If NAT is not configured, this is the same as Remote IP.

Therefore, sessions are monitored whether the device:

- sends the packets
- receives the packets
- initiates the session
- responds to a session initiated by another device

The **copyto** parameter specifies the Eth interface or VLAN to which the firewall sends the copies of monitored packets. Packets are sent as Layer 2 broadcasts to this interface. You should connect a device directly to this interface that can correctly capture the broadcast packets, such as a PC running packet capturing software. In particular, the device should not forward or reply to the packets. Duplicated packets use the router or switch's MAC address as their source MAC address, and have a broadcast destination MAC address (ff:ff:ff:ff:ff:ff).

The **applyto** parameter specifies where the monitoring for this device applies. If you specify **private**, the firewall copies packets at the private interface. This is before firewall processing for outgoing packets and after firewall processing for incoming packets. If you specify **public**, the firewall copies packets at the public interface. This is before firewall processing for incoming packets and after firewall processing for outgoing packets. If you specify **both**, the firewall copies packets at both the public interface and the private interface. The default is **private**.

The combination of **ip** and **applyto** uniquely identifies a monitor. For example, you can create different monitors to monitor the same IP address on the private and the public interfaces.

Example To monitor traffic to and from the host whose IP address is 192.168.1.1, when the monitor is plugged into the port in vlan2, use the command:

```
add fire mo=1 ip=192.168.1.1 cop=vlan2
```

To monitor traffic to and from the host whose IP address is 192.168.1.1 so that you can check the firewall's NAT configuration, make a monitor by using the command:

```
add fire mo=1 ip=192.168.1.1 cop=vlan2 app=both
```

Use filtering within your packet capturing software to separate the private and public traffic. Alternatively, you can make two monitors by using the commands:

```
add fire mo=1 ip=192.168.1.1 cop=vlan2 app=priv
add fire mo=2 ip=192.168.1.1 cop=vlan3 app=pub
```

Using two monitors may make it easier to see which traffic came from the private interface and which came from the public interface.

add firewall policy nat

Syntax

```
ADD FIREwall POLIcy=policy-name
   NAT={ENAPt|ENHanced|STAndard} INTerface=interface
   [IP=ipadd[-ipadd]] GBLINterface=interface
   [GBLIP=ipadd[-ipadd]]
```

Description

The new **enapt** option for the **nat** parameter specifies that the firewall performs Enhanced NAPT, which is a port restricted cone NAT. With ENAPT, the firewall translates all private IP addresses to one global IP address, and also translates TCP or UDP ports. It remembers the private to public mapping and applies the same mapping for all simultaneous sessions that involve the same private IP address and port.

The **ip** parameter is not valid with ENAPT.

The **gblip** parameter specifies the public IP address to which the firewall translates the private address, and is optional with ENAPT. If the **gblip** parameter is not specified, the IP address of the global interface is used as the global IP internet address. This is useful in configurations where the public interface does not have a static IP address, for example, a dial-up user who is dynamically allocated an IP address by the ISP.

If **nat** is set to **enhanced** or **enapt**, then you generally only need to specify a single global IP address. You only need to specify a range of public addresses if sessions will be initiated from the public side to private hosts via multiple public addresses. For example, if you have two private servers offering the same service and each server corresponds to a different public IP address, you need to specify a range that includes both public IP addresses. However, NAT only uses the first address of the range as a source address for packets in outgoing sessions. You need to specify all the public addresses so that you can configure rules to pass the traffic through to the correct private host.

Example

To translate IP addresses and ports for all traffic between the private interface vlan2 and the public interface vlan3, which are attached to the policy named “example”, use the command:

```
add fire poli=example nat=enap int=vlan2 gblin=vlan3
```

add firewall policy rule

Syntax

```
ADD FIREwall POLIcy=policy-name RUle=rule-id
   ACtion={ALLOw|DENY|NAT|NONat} INTerface=interface
   PROTocol={protocol|ALL|EGP|GRE|ICmp|OSPF|SA|TCP|UDP}
   [AFTer=hh:mm] [BEFore=hh:mm]
   [DAYs={ALL|MON|TUE|WED|THU|FRI|SAT|SUN|WEEKDay|WEEKEnd}
   [,...]] [ENCapsulation={NONE|IPSec}] [GBLIP=ipadd]
   [GBLPort={ALL|port[-port]|service-name}]
   [GBLRemoteip=ipadd[-ipadd]] [IP=ipadd[-ipadd]]
   [LISt={list-name|RADius|MACRADius}]
   [NATType={DOuble|ENAPt|ENHanced|NApt|REVerse|STAndard}]
   [NATMask=ipadd] [POrt={ALL|port[-port]|service-name}]
   [REMoteip=ipadd[-ipadd]] [SOurceport={ALL|port[-port]}]
   [TTL=hh:mm]
```

Description

The new **enapt** option for the **nattype** parameter specifies that the firewall performs Enhanced NAPT on traffic that matches the rule.

IP and port parameters in policy rules

The following table shows the IP address and port parameters that you can use when you create a rule to apply ENAPT to matching traffic. It indicates which parameters the rule can match against to select packets, and which parameters specify translations. The table also indicates whether the rule matches source or destination IP address or port. For example, when the private interface processes an outgoing packet for a session that the private side initiated, **ip** is the packet's source address and **remoteip** is its destination address.

Rule-based NAT type	Interface	Type of address or port	Match	Translate to
ENAPT (**nattype= enapt**)	Private: outgoing traffic	Source IP	**ip**	**glbip** (required)
		Destination IP	**remoteip**	Not translated
		Source TCP/UDP port	**sourceport**	Translated; no user control
		Destination TCP/UDP port	**port**	Not translated

The following table shows the IP address and port parameters that you can use when you create a rule on a policy that uses interface-based ENAPT. It indicates which parameters the rule can match against to select packets, and which parameters specify translations. In this situation, the rule specifies whether to allow or deny the traffic, and what the IP address and port are translated to. The ENAPT is defined by using the **add firewall policy nat** command, but the rule translations override the interface-based translations.

Interface-based NAT type	Interface	Type of address or port	Match	Translate to
ENAPT	Public: incoming traffic destined for a private server etc	Destination IP	**glbip** (required)	**ip** (required)
		Source IP	**remoteip**	Not translated
		Destination TCP/UDP port	**gblport** (required)	**port** (required)
		Source TCP/UDP port	**sourceport**	Not translated

Example In this example, the host with private IP address 192.168.1.1 wishes to play Xbox Live, through the firewall policy called "zone1", over the private interface vlan1. The router's public IP address is 192.0.2.1. You want to limit the rule so that it only translates Xbox Live traffic, which has a source port of 3074. To configure this, use the commands:

```
add fire poli=zone1 ru=1 ac=nat natt=enap int=vlan1 prot=udp
   ip=192.168.1.1 gblip=192.0.2.1 so=3074

add fire poli=zone1 ru=2 ac=nat natt=enap int=vlan1 prot=tcp
   ip=192.168.1.1 gblip=192.0.2.1 so=3074
```

delete firewall monitor

Syntax `DELete FIREwall MOnitor=`*`monitor-id`*

where:

- *monitor-id* is an integer from 1 to 65535

Description This command deletes a monitor. The firewall stops copying packets that come to and from the IP address specified in that monitor.

Example To stop monitoring the host with IP address 192.168.1.1, which is monitored by Monitor 1, use the command:

```
del fire mo=1
```

disable firewall monitor

Syntax `DISable FIREwall MOnitor`

Description This command stops the firewall from monitoring traffic. Monitoring is disabled by default.

Example To stop the firewall from monitoring any hosts, use the command:

```
dis fire mo
```

enable firewall monitor

Syntax `ENAble FIREwall MOnitor`

Description This command enables the firewall to monitor traffic. When you enable monitoring and specify the IP addresses of devices to monitor, the router or switch makes a copy of all packets that go to or from those devices. To specify devices to monitor, use the **add firewall monitor** command on page 53.

Monitoring is disabled by default.

Example To allow the firewall to start monitoring devices, use the command:

```
ena fire mo
```

set firewall monitor

Syntax

```
SET FIREwall MOnitor=monitor-id [IP=ipadd]
   [COPyto=ip-interface] [APPlyto={PRIVate|PUBlic|BOTH}]
```

where:

- *monitor-id* is an integer from 1 to 65535
- *ipadd* is an IPv4 address in dotted decimal notation
- *ip-interface* is a VLAN or Eth interface such as vlan2 or eth0. The interface can be a logical interface such as vlan2-1 or eth0-1

Description This command modifies a session monitor.

Note that modifying the monitor does not reset its counters.

The **monitor** parameter specifies the identification number for the monitor.

The **ip** parameter specifies the IP address of the monitored device. The firewall monitors any firewall sessions that have this IP address in any of the session fields. These session fields display in output from the **show firewall session** command, and are summarised in the following table.

IP field name in session	Meaning
IP	The source address of outbound packets and the destination address of inbound packets in this session, as seen on the private side of the firewall.
Remote IP	The destination address of outbound packets and the source address of inbound packets in this session, as seen on the private side of the firewall.
Gbl IP	The source address of outbound packets and the destination address of inbound packets in this session, as seen on the public side of the firewall. If NAT is not configured, this is the same as IP.
Gbl Remote IP	The destination address of outbound packets and the source address of inbound packets in this session, as seen on the public side of the firewall. If NAT is not configured, this is the same as Remote IP.

Therefore, sessions are monitored whether the device:

- sends the packets
- receives the packets
- initiates the session
- responds to a session initiated by another device

The **copyto** parameter specifies the Eth interface or VLAN to which the firewall sends the copies of monitored packets. Packets are sent as Layer 2 broadcasts to this interface. You should connect a device directly to this interface that can correctly capture the broadcast packets, such as a PC running packet capturing software. In particular, the device should not forward or reply to the packets. Duplicated packets use the router or switch's MAC address as their source MAC address, and have a broadcast destination MAC address (ff:ff:ff:ff:ff:ff).

The **applyto** parameter specifies where the monitoring for this device applies. If you specify **private**, the firewall copies packets at the private interface. This is before firewall processing for outgoing packets and after firewall processing for incoming packets. If you specify **public**, the firewall copies packets at the public interface. This is before firewall processing for incoming packets and after firewall processing for outgoing packets. If you specify **both**, the firewall copies packets at both the public interface and the private interface. The default is **private**.

The combination of **ip** and **applyto** uniquely identifies a monitor. For example, you can create different monitors to monitor the same IP address on the private and the public interfaces.

Example To change Monitor 1 so that it sends copied packets out over vlan3, use the command:

```
add fire mo=1 cop=vlan3
```

set firewall policy

Syntax

```
SET FIREwall POLIcy=policy-name
   [ICMPUnreachabletimeout=seconds]
   [MACCachetimeout=max-age] [MAXUPNPPORTMAPS={0..1000}]
   [OTHERTimeout=minutes] [RADIuslimit=number
   [TCPTimeout=minutes] [UDPTimeout=minutes]
   [UPNP={ON|OFF|YES|NO|ENABLED|DISABLED}]
```

where *seconds* is an integer from 0 to 65535

Description The new **icmpunreachabletimeout** parameter specifies the delay before the firewall deletes a session after it receives an ICMP unreachable message for that session. The default is 0 seconds, which means the firewall deletes the associated session immediately.

If you are configuring the firewall to allow Xbox Live sessions, increase this timeout to a few seconds, for example, 20. Otherwise you may be unable to connect to remote Xboxes that are also behind a firewall.

show firewall

Syntax `SHow FIREwall`

Description This command displays firewall settings, including a summary of each policy (Figure 15, Table 7).

Figure 15: Example output from the **show firewall** command for a policy that uses interface-based ENAPT

```
Firewall Configuration

Status ..................... disabled
Enabled Notify Options .... manager
SIP ALG enabled ........... FALSE
Maximum Packet Fragments .. 20
Policy : example
  TCP Timeout (s) ................... 3600
  UDP Timeout (s) ................... 1200
  Other Timeout (s) ................. 1200
  ICMP Unreachable Timeout (s) ...... 0
  TCP Handshake Timeout Mode ........ Normal
  SMTP Domain ....................... not set
  TCP Setup Proxy ................... enabled
  UPNP .............................. disabled
    WAN interfaces .................. none
    LAN interfaces .................. none
    Maximum port maps ............... 250
  SIP ALG ........................... disabled
  Private Interface : vlan2
  Public Interface  : vlan3
    Method .......................... dynamic
    NAT ............................. enapt
      Method .......................
      Private Interface ............. vlan2
      Global IP ..................... 192.168.2.3
```

Table 7: New and changed parameters in output of the **show firewall** command

Parameter	Meaning
ICMP Unreachable Timeout	The number of seconds before the firewall deletes a session after it receives an ICMP unreachable message for that session.
NAT	The type of network address translation that the policy performs. If the policy performs ENAPT, "enapt" is displayed.

show firewall policy

Syntax `SHow FIREwall POLIcy[=policy-name] [COUnter] [SUMmary]`

Description This command displays firewall policy settings (Figure 16, Table 8).

Figure 16: Example output from the **show firewall policy** command for a policy that uses interface-based ENAPT

```
Policy : example
  TCP Timeout (s) ..................... 3600
  UDP Timeout (s) ..................... 1200
  Other Timeout (s) ................... 1200
  ICMP Unreachable Timeout (s) ...... 0
  TCP Handshake Timeout Mode ........ Normal
  MAC Cache Timeout (m) ............. 1440
  RADIUS Limit ....................... 100
  Accounting ......................... disabled
  Enabled Logging Options ........... none
  Enabled Debug Options ............. none
  Enabled Debug Modes ............... none
  Enabled Debug IP Address .......... none
  Identification Protocol Proxy ..... enabled
  Enabled IP options ................ none
  Enhanced Fragment Handling ........ none
  Enabled ICMP forwarding ........... none
  Receive of ICMP PINGS ............. enabled
  Number of Notifications ........... 0
  Number of Deny Events ............. 0
  Number of Allow Events ............ 0
  Number of Active TCP Opens ........ 0
  Number of Active Sessions ......... 0
  Cache Hits ........................ 0
  Discarded ICMP Packets ............ 0
  SMTP Domain ....................... not set
  FTP Data Port ..................... RFC enforced
  TCP Setup Proxy ................... enabled
  UPNP .............................. disabled
    WAN interfaces .................. none
    LAN interfaces .................. none
    Maximum port maps ............... 250
  SIP ALG ........................... disabled
  Private Interface : vlan2
    Trust Private ................... yes
  Public Interface  : vlan3
    Method .......................... dynamic
    NAT ............................. enapt
      Method .......................
      Private Interface ............. vlan2
      Global IP ..................... 192.168.2.3
```

Table 8: New and changed parameters in output of the **show firewall policy** command

Parameter	Meaning
ICMP Unreachable Timeout	The number of seconds before the firewall deletes a session after it receives an ICMP unreachable message for that session.
NAT	The type of network address translation that the policy performs. If the policy performs ENAPT, "enapt" is displayed.

show firewall monitor

Syntax `SHow FIREwall MOnitor`

Description This command displays information about session monitoring (Figure 17, Table 9).

Figure 17: Example output from the **show firewall monitor** command

```
Firewall Monitoring

Status ..................... enabled

Monitor IP                    Apply to    Copy to    In(pkts)    Out(pkts)
-------------------------------------------------------------------------------
1       192.168.1.1           PRIVATE     VLAN2      0           0
2       192.168.1.2           PRIVATE     VLAN2      24          26
-------------------------------------------------------------------------------
```

Table 9: Parameters in output of the **show firewall monitor** command

Parameter	Meaning
Status	Whether firewall session monitoring is enabled or disabled.
Monitor	The identification number of each monitor. This number uniquely identifies the monitored device.
IP	The IP address of the monitored device. The firewall copies all traffic that comes to or from this address.
Copy to	The interface to which the firewall transmits copies of packets; one of a VLAN, an Eth interface, or "deleted" if the interface has been deleted. Deleting the interface deactivates the monitor. Adding the interface back again reactivates the monitor.
Apply to	The firewall interface on which the firewall captures packets; one of PRIVATE, PUBLIC, or BOTH. PRIVATE means that packets are copied before firewall processing for outgoing packets and after firewall processing for incoming packets. PUBLIC means that packets are copied before firewall processing for incoming packets and after firewall processing for outgoing packets.
In	The number of incoming packets that the firewall has captured using this monitor. The counter resets when the router or switch restarts.
Out	The number of outgoing packets that the firewall has captured using this monitor. The counter resets when the router or switch restarts.

Example To display the number of packets that the firewall has copied, use the command:

```
sh fire mo
```

Reverse Telnet Without Authentication

Reverse Telnet allows you to connect a device such as a modem to an asynchronous port, and then to control that device by telneting from your PC to the router or switch. Reverse Telnet is described in RFC 2217, *Telnet Com Port Control Option*. The router or switch listens on a TCP port, and the TCP listen port number depends on the asyn port number (excluding asyn0), according to the following formula:

```
TCP port number = 2000 + asyn port number
```

For example:

- the reverse Telnet connection for connection to **asyn1** uses the TCP port number **2001**
- the reverse Telnet connection for connection to **asyn5** uses the TCP port number **2005**. Asyn5 would be the first port of the second asynchronous PIC on the router or switch, when two PICs are plugged into bay 1.

The Telnet connection to the router or switch is authenticated, so when you use reverse Telnet to access a remote device through the router or switch, you have to enter a username and password. Some remote devices, such as other routers, also require authentication. This can mean that you have to enter a username and password twice. Software Version 2.7.6 simplifies this by allowing you to establish the initial reverse Telnet connection to the router or switch without authentication.

To stop reverse Telnet from requiring authentication of the Telnet session, use the new command:

```
set rtelnet authentication=off
```

To see if authentication is turned off, use the command:

```
show config dynamic=telnet
```

Command Change Summary

The following table summarises the new command (see **Command Reference Updates**).

Command	Change
set rtelnet	New command

Command Reference Updates

This section describes any new commands and the changed portions of any modified commands and output screens. It uses boldface to highlight new parameters and options of existing commands, and new fields of existing output.

set rtelnet

Syntax `SET RTELnet AUthentication={OFf|ON|NO|YEs|FAlse|TRue}`

Description This command determines whether users who connect to an asynchronous port through reverse Telnet must log in and be authenticated. If the device that is connected to the asynchronous port also requires authentication, then turning authentication off on the reverse Telnet connection stops users from having to log in twice.

The **authentication** parameter specifies whether the router or switch authenticates reverse Telnet connections. If you specify **on**, users must log in to establish a reverse Telnet session. The router or switch only establishes the session if the supplied username and password are valid. If you specify **off**, users do not have to log in. The values **on**, **yes** and **true** are equivalent. The values **off**, **no** and **false** are equivalent. The default is **on**.

Example To establish reverse Telnet sessions without authenticating user information, use the command:

```
set rtel au=of
```